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TABLE OF CONTENTS.

Page.

LEADING ARTICLES:

The Erection of Long Span Trusses by the End-Launching Method—The French River Bridge of the Canadian Pacific Ry. (illustrated)..... 85

Reminiscences of Early Days in American Engineering: Recollections of the Late Randolph Brandt Latimer..... 88

Reinforced-Concrete Conduits for Electric Cables; Long Island R. R. (illustrated); Frederick Auryansen, Assoc. M. Am. Soc. C. E..... 90

Salaries of Technical Graduates; Walter B. Snow, M. Am. Soc. M. E..... 90

Civil Engineering a Close Profession in Louisiana..... 91

Concrete Pile Foundations for a Paris Railway Bridge (illustrated)..... 92

Coal Dust as a Factor in Mine Explosions..... 93

A Microscopic Investigation of Broken Steel Rails; Manganese Sulphide as a Source of Danger (illustrated); Henry Fay..... 94

Grade Crossing Removal of the Philadelphia & Reading R. R. in the City of Philadelphia (illustrated)..... 96

Packing Strips for Worn Rail Joints (illustrated)..... 97

A Proposed Land Reclamation and Dock Scheme for Newark, N. J. (illustrated) 98

The Effect of Alkali Soils on Concrete..... 99

The Place of Shop Training in Engineering Education: Papers and Discussions at the Recent Convention of the American Institute of Electrical Engineers 103

The Annual Convention of the American Boiler Makers' Association..... 104

Page.

Statistics of Railways in the United States..... 104

Street Railway Regulation in the District of Columbia..... 105

The Wreck of the Cazadero Hydro-Electric Power Plant on the Clackmas River, Portland, Ore..... 106

An American Degree Conferred by an English University..... 106

EDITORIAL..... 101

Shall the State Supervise Engineers or Engineering Work?—A Warning to Hydro-Electric Power Plant Designers—The Standard Cement Specification of the American Society for Testing Materials—The Increasing Drain on the Forests.

The Effect of Alkali Soil on Concrete..... 101

LETTERS TO THE EDITOR..... 102

Comparing Tunnel Driving Records; Frank Richards—The Strength Clause in the Cement Specification; Henry S. Spackman—Moments in Grillage Beams and Projecting Footings (illustrated); Edward Godfrey—Notes and Queries.

ENGINEERING NEWS OF THE WEEK..... 107

PERSONALS..... 108

ENGINEERING SOCIETIES..... 108

THE ERECTION OF LONG SPAN TRUSSES BY THE END-LAUNCHING METHOD.—THE FRENCH RIVER BRIDGE, CANADIAN PACIFIC RY.

In the construction of a branch line from Romford to Bolton Junction, Ont., the Canadian Pacific Ry. had occasion during the past year to construct a single-track bridge across the French River, about 43 miles south of Romford, at a point where the river is so deep (90 ft. for most of the width) that a 412 ft. 8 in. span was required for the main portion of the crossing. On account of the extreme depth and the consequent prohibition in the use of falsework, the matter of erection caused considerable study, but it was finally determined to make this main span a riveted through truss and to erect it by the little used protrusion method, supporting the outer end, as it moves across, by a floating scow. The erection of a large truss by such a method is a matter of considerable interest to the profession, and we reproduce here a portion of a paper* upon the subject recently read before the Canadian Society of Civil Engineers by Mr. C. N. Monsarrat, Engineer of Bridges of the Canadian Pacific Ry.

FIG. 1. ERECTION OF THE FRENCH RIVER BRIDGE ON THE CANADIAN PACIFIC RY.
412-Ft., 1,282-Ton Bridge Erected by the End Launching Method. Mr. C. N. Monsarrat, M. Can. Soc. C. E., Engineer of Bridges.

The French River Bridge, as shown in Fig. 3, consists of two approach plate-girder spans, each 60 ft. long, and a main span of a riveted, subpanelled, through Warren truss with inclined top chords, weighing 1,282 tons, the whole bridge being designed for the Canadian Pacific Ry. 1905 specification, providing for a live load of two typical consolidation engines coupled together, weighing 337,000 lbs. each, followed by a uniform train load of 4,000 lbs. per lin. ft. There is but slight variation from standard practice in the design, except at the end bearings, where a novel device, patented by Mr. P. B. Motley, M. Can. Soc. C. E., has been used. This device was not described in the original paper, but we are indebted to Mr. Monsarrat for the following description and accompanying cut. (Fig. 2.)

The roller bearing consists of a cast-steel shoe with a spherical top into which the similarly curved bed plate fits and which is separated from the plane roller plate by a nest of nine cylindrical steel rollers. These latter are held in position by four pintles or dowels, two of which are screwed into the upper and lower plates, respectively, and fit, at their free ends, into the opposite ends of a cylindrical hole drilled through the next to the outside rollers. The protruding end of each pintle is a surface of revolution, the generatrix of which is formed by compounded circles closely approximating two cycloids. When the bridge moves in or out under expansion this cycloidal surface allows a free movement of the bearing longitudinal with the bridge, but prevents the rollers from moving off the base or, what is more important, from getting out of a line truly transverse to the line of the bridge. The bearing is also provided with a dust guard, placed around the rollers, consisting of a frame of channels, planed to a trifle less height than the diameter of the 6-in. rollers. These channels have vertically slotted holes to take the trunnions at the end of the rollers, so that the frame bears hard upon the lower plates and against the ends of the rollers, making a practically dust-proof box, which, however, can readily be taken apart for inspection at any time.

The steelwork rests on two wing-wall abutments and two slender battered piers, all founded on the solid rock, and made of mass concrete. Both river piers were constructed in open caissons sunk to the rock bottom and filled with concrete deposited under water. On account of the remote location of the bridge site, the difficulties in construction were very pronounced. All material had to be brought from Georgian Bay, at the mouth of the French River, over rapids and by portages, through a virgin country.

Probably the most interesting feature in connection with this work was the erection of the main truss span. On account of the great depth of water, it was not possible to build falsework and erect the span in its proper place, so after due consideration of several possible schemes of erection it was decided to erect the span on the north approach embankment, on the center line of the bridge (produced) and launch it forward by supporting the forward end on a large scow, and sliding the rear, or north end, on a skidway of greased rails. [The current here is very slow, averaging about 3/10 mile per hour, so no danger was anticipated, nor finally encountered, from that score.—Ed.] The embankment immediately north of the north abutment was a new fill consisting mainly of boulders, coarse gravel, and sand, with a maximum height of about 25 ft. against the abutment, running out to the natural surface of the ground about 100 ft. north. The width of the embankment at subgrade was 16 ft., and in order to provide a proper bearing for the skidway, it had to be widened to 26 ft. On this specially prepared roadbed two parallel skidways, about 316 ft. long, were built, 10 ft. center to center, each consisting of railway ties about 15 ins. on centers, with a 12 × 12 in. timber 16 ft. long, every 10 ft., to tie the two skidways together. On these ties were laid five lines of 12 × 12 in. longitudinal timbers, over which was laid a flooring of 3 × 12-in. planks, supporting seven lines of 80-lb. rails, laid with joints staggered and securely spiked and bolted together.

The steel work was accordingly erected on the embankment, using a specially-designed traveler, consisting of two 60-ft. boom derricks of ten tons capacity each, mounted upon a timber framework designed to travel upon rails gaged 14 ft. centers, the platform of the traveler being placed 12 ft. 7 ins. above top of rail so that lorry cars, loaded with bridge material, could readily pass underneath on standard gage railway track, and the material be picked up by the traveler booms. Each of the 60-ft. boom derricks was handled by separate double-drum engines, placed at the rear end of the traveler and forming part of the 20 tons of counterweight on each side required to provide for the uplift due to loading the boom derricks. The assembling of the span on the embankment was, in itself, quite a difficult operation, on account of the large size of the members to be handled, some of them weighing as much as 40 tons. Before any work was started, the order in which each member was to be erected was fixed and clearly shown on the erection diagram. In order to permit of supporting the forward end of the span, by the scow, it was necessary to erect it with its south end projecting over the water about 103 ft. The bottom chords and floor system, excepting that portion overhanging the water, were first placed in position by means of a self-propelling derrick car, ties were then laid for temporary track on the steel stringers, and the traveler erected with which the balance of the span was assembled.

In placing the two end bottom chord sections on top of the stiffening span, it was necessary to place the scow in the temporary position shown in dotted lines on the plant in Fig. 3, so that they could be placed by the traveler, the forward trucks of which could not be run

*Erection of the French River Bridge—Canadian Pacific Ry. By C. N. Monsarrat, M. Can. Soc. C. E. Paper read before the General Section, Canadian Society of Civil Engineers, April 16, 1908.

out beyond the panel point resting over the bridge seat on the abutment. To do this it was necessary to blast out some of the rock projecting out under the water, to clear the northeast corner of the scow. When these chords were placed the scow was returned to its correct position and the erection of the overhanging portion, as a cantilever, from the portion of the span previously erected upon the embankment, was proceeded with.

started. The ⅞-in. field rivets, of which there were approximately 60,000, were driven by means of pneumatic riveting hammers, a compressed air plant having been installed for the purpose.

The scow was equipped with boiler and double-drum hoisting engine, as well as a centrifugal pump with 8-in. suction and 6-in. discharge pipes, and a sluice arrangement located over the double bulkhead forming the ends of the two component parts of the scow by which the water pumped in could be controlled, and directed into either half of the scow. Each intermediate bulkhead had an 8 × 8 in. hole near the bottom so as to equalize the water in each compartment.

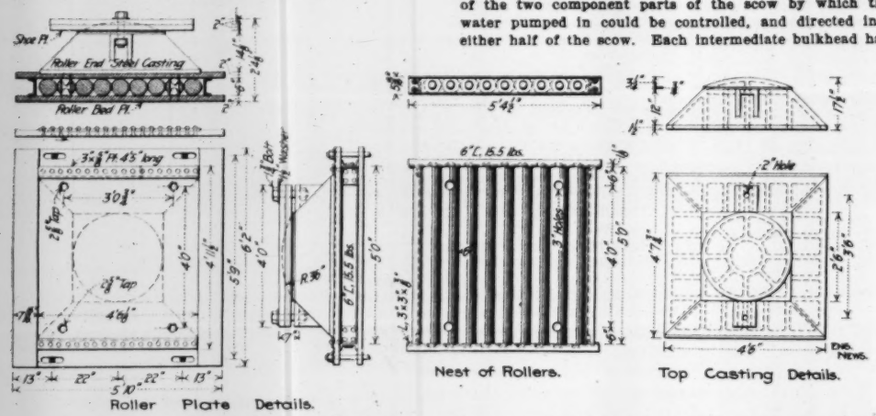


FIG. 2. DETAILS OF END ROLLER BEARINGS, FRENCH RIVER BRIDGE.

In order to place the scow at the proper elevation under the projecting end of the large span, it was necessary to depress it about 4 ft. by pumping in water. As this water ballast would render the scow unstable transversely until it took a bearing under the 415-ft. span, it was necessary to use a small balancing scow, which was placed at the north side of the large scow and secured to the latter and the stiffening span, by means of diagonal and horizontal struts, and was equipped with counterweight and adjusting screws to provide for any raising or lowering of the large scow. The general dimensions of the large scow, referred to, which was built at the site, were: Length, 155 ft.; 33 ft. beam, and 12 ft. deep; made in two sections for convenience in launching. It was built of 12 × 12-in. timbers for the ends; bulkheads and intermediate frames, 6 × 12 ins. sheathing on the sides, 4 × 12 ins. for the bottom, with joints staggered and secured to the framing with ⅝ × 12-in. lag screws. The bulkheads were spaced 22 ft. 1 in. center to center to conform with the panel points of the 150-ft. through riveted truss span,* which was erected on the scow as a supporting span, each panel point being blocked on a cross bulkhead. All seams in the sheeting, up to about 2 ft. above load water line, were calked with oakum.

On completion of the assembling of the large span, the traveler was taken down, the ties used as temporary floor removed, and all field connections excepting end portals and sway bracing, were riveted before launching was

*This supporting truss was built to be erected at a crossing over the Wanapitae River, but was so designed that it could be used in the erection of the French River Bridge.—Ed.

The load from the south end of the 415-ft. span, and the 150-ft. stiffening truss supported by the scow, was about 1,000 tons. The load from the north end of the span, amounting to about 640 tons, was transmitted to the skidway through two large fixed end cast-iron shoes (used temporarily for the purpose), placed 10 ft. c. to c., under the end floor beam, which had been designed with a special view to such use. This arrangement of the castings left a clear space under the truss bearings for landing of the span on oak blocking over the bridge seats preparatory to its being jacked down to its bearings. The oak blocking was required for the temporary support of the span at an elevation about 8 ft. 5¼ ins. higher than its final position, this height being necessary to permit the skidway to pass over the parapet wall of the abutment. Between the aforementioned cast-iron shoes and the skidway rails was placed a ⅞-in. steel plate, large enough to include both castings, with strips riveted to its under side to form guides to engage the rails of the skidway.

When the scow was in position under the end of the main span, in front of the north abutment, transverse to the center line of the bridge, anchors were located on the opposite shore at 45°. Holes were drilled in the rock and 3½-in. bars were grouted in a vertical position. To each anchor was secured a two-sheave steel block, four lines of ⅝-in. wire cable, forming the two lines which were wound up simultaneously on the drums of the hoisting engine on the scow, as the scow was moved forward, the floating end of which was subject to any effect of wind or current.

The tackle used to haul the 415-ft. span into position consisted of two specially-constructed pulley blocks, having 14 sheaves each, through which was reeved a ⅝-in. diameter steel wire cable 1,000 ft. long, with a fall line leading back to the drum of a hoisting engine located on the land at the north end of the skidway. This engine was a 72-HP. double-drum hoisting engine, with two cylinders 8 × 12 ins., boiler 41 ins. in diameter by 108 ins. high, and capable of pulling 8,000 lbs. on a single line.

One of the large blocks was secured to the skidding plate under the castings, and the other to the rear end of a string of bottom laterals—belonging to a 250-ft. through span designed for the crossing of the Pickerel River, a short distance south of the French—consisting of two angles 6 × 4 × ½ in. each, used as pulling links. These were in turn secured by a pin to a box girder supported by struts in front of the north abutment. Each section of these laterals was about 30 ft. long, and when the two large blocks were brought together one or two sets of lateral links were removed and the blocks overhauled. When the last section was reached it was removed, and the forward block secured by the pin direct to the box girder.

When everything was in readiness, on the evening of October 27, 1907, the scow was pumped out by means of the centrifugal pump, until the span was raised off the blocking. When this occurred it was found that there still remained a foot of water in the scow, showing that an ample margin of buoyancy had been allowed. At 8 a.m. on the 28th, the engine was started, and with the assistance of a slight shove from two 40-ton hydraulic jacks, the large span started on its way, moving on the well greased skidding rails at the rate of 4 to 6 ft. per minute. Considerable time was lost owing to the inability of the small boiler of the hoisting engine to keep up a

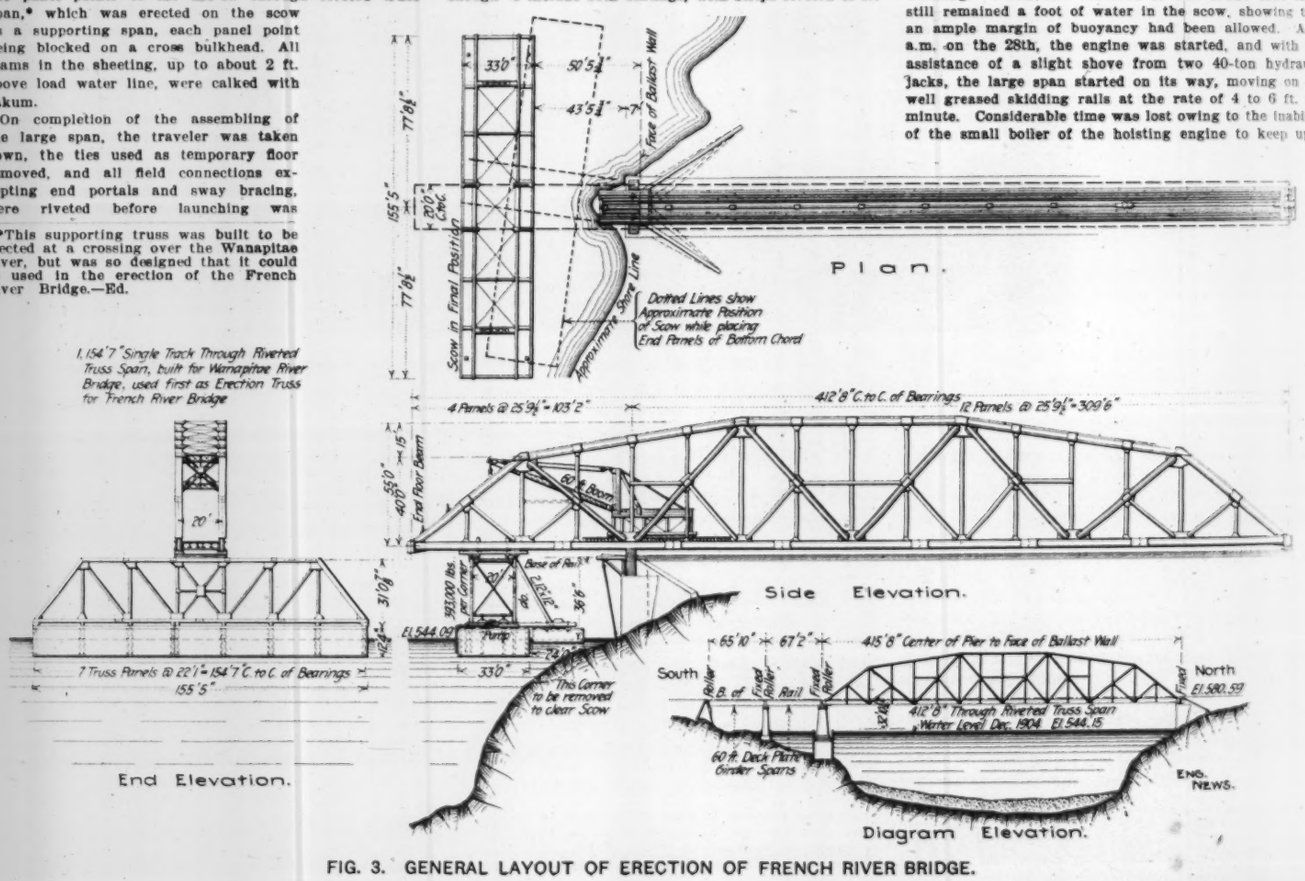

1,154'7" Single Track Through Riveted Truss Span, built for Wanapitae River Bridge, used first as Erection Truss for French River Bridge
Plan.
Side Elevation.
End Elevation.
Diagram Elevation.
Dotted Lines show Approximate Position of Scow while placing End Panels of Bottom Chord
Scow in Final Position
Face of Ballast Wall
Approximate Shore Line
4 Panels @ 25'9½" = 103'2"
12 Panels @ 25'9½" = 309'6"
412'8" C. to C. of Bearings
End Floor Beam
60 ft. Beam
Base of Rail
Pump
7 Truss Panels @ 22'1" = 154'7" C. to C. of Bearings
155'5"
This Corner to be removed to clear Scow
South
North
415'8" Center of Pier to Face of Ballast Wall
412'8" Through Riveted Truss Span
Water Level Dec. 1904 El. 544.15
60 ft. Deck Plate Girder Spans
ENG. NEWS.

FIG. 3. GENERAL LAYOUT OF ERECTION OF FRENCH RIVER BRIDGE.

sufficient st[illegible] pressure and also in the overhauling of the very h[illegible] tackle.

The actu[illegible]ime occupied in moving the span was 3 hours, and [illegible] overhauling tackle, etc., 4 hours. The span was l[illegible]d on its blocking at 4.05 p.m., without a hitch of an[illegible]ind.

Trouble [illegible] been anticipated with settlement of the skidway on [illegible]e new dump in view of the 640-ton concentrated mov[illegible] load passing over it, but in no case was the settlement [illegible]r six inches, and it was uniform at both sides, the [illegible]atest variation of the span from the level being abou[illegible] in. in its width. So smoothly did the span move that [illegible] was possible to set it in its final location with the [illegible]ine alone, without the assistance of jacks, and by me[illegible] of the steering control afforded by the forward guy [illegible]es the span was within ¾-in. of its proper alinement [illegible]en landed on the main pier on the south side of the riv[illegible]

The lowe[illegible]ng of the span to its final bearings on the bridge sea[illegible] was accomplished by means of two specially-constructe[illegible]00-ton hydraulic jacks. After the span was landed on [illegible]e wooden blocking, the skidway, castings, and skidding [illegible]ate were removed and cast-steel cap plates were bolte[illegible]d to the under side of the floor beam, these plates bein[illegible] turned out to fit over a cast-steel disk plate 21 ins. diameter by 3½ ins. thick, placed on top of the plunger of each jack; between the bottom edges of these disks and the shoulders of the jack cylinders were placed a number of ¼-in. steel plate half-ring shims, as a safety precaution against accident should anything go wrong with the jacks; in which event the weight would be transferred to the massive jack cylinders.

The jacks were each placed on blocking consisting of three super-imposed steel cylinders filled with concrete, over which were placed a number of cast-iron cellular blocks 2 ft. 10 ins. in diameter by 3½ ins. thick. The ¼-in. shim plates were removed one at a time as the span was lowered so that in no case was there left a space greater than ¼-in. between the under side of the disk and the jack shoulders. Before the last of these shims was removed the span was landed on the oak blocking, the jacks released and one or more sections of cast-iron blocking removed, the jacks pumped up, shims replaced, and the operation repeated until all the cast-iron blocking had been removed, when one of the concrete-filled cylinders was taken out, the casting and shims replaced, and so on until the span was landed on its permanent shoes. The oak blocking was also removed as the span was lowered, the top of it being kept high enough to free the jacks while shims were being adjusted.

When the span had been lowered about 4 ft. at one end, the jacks were transferred to the other and similar operations carried out there. That end, however, was lowered right down to the shoes before the jacks were returned to the end first lowered.

The bridge was designed by the Bridge Department of the Canadian Pacific Railway at Montreal, under the direction of C. N. Monsarrat, Engineer of Bridges. The substructure was built by the Toronto Construction Company of Toronto, under supervision of Mr. F. S. Darling, Division Engineer of Construction, while the steel work was manufactured and erected by the Canadian Bridge Company, of Walkerville, Ont. Mr. A. L. Colby was manager of construction, and Mr. C. Prettie was general foreman in charge of the steel erection.

The writer believes that this is the longest and heaviest single track fixed span yet built and erected in Canada, or ever erected by the end launching method.

FIG. 4. FRENCH RIVER BRIDGE HALF WAY ACROSS THE RIVER.

A very similar piece of work was carried out in Finland, during the year just passed, by a German bridge-building concern, the Brückenbauanstalt Gustavsburg, according to a note in the "Schweizerische Bauzeitung" of April 4, 1908. At Nyslott a simple truss bridge of 410 ft. span, weighing 850 tons, was to be erected.

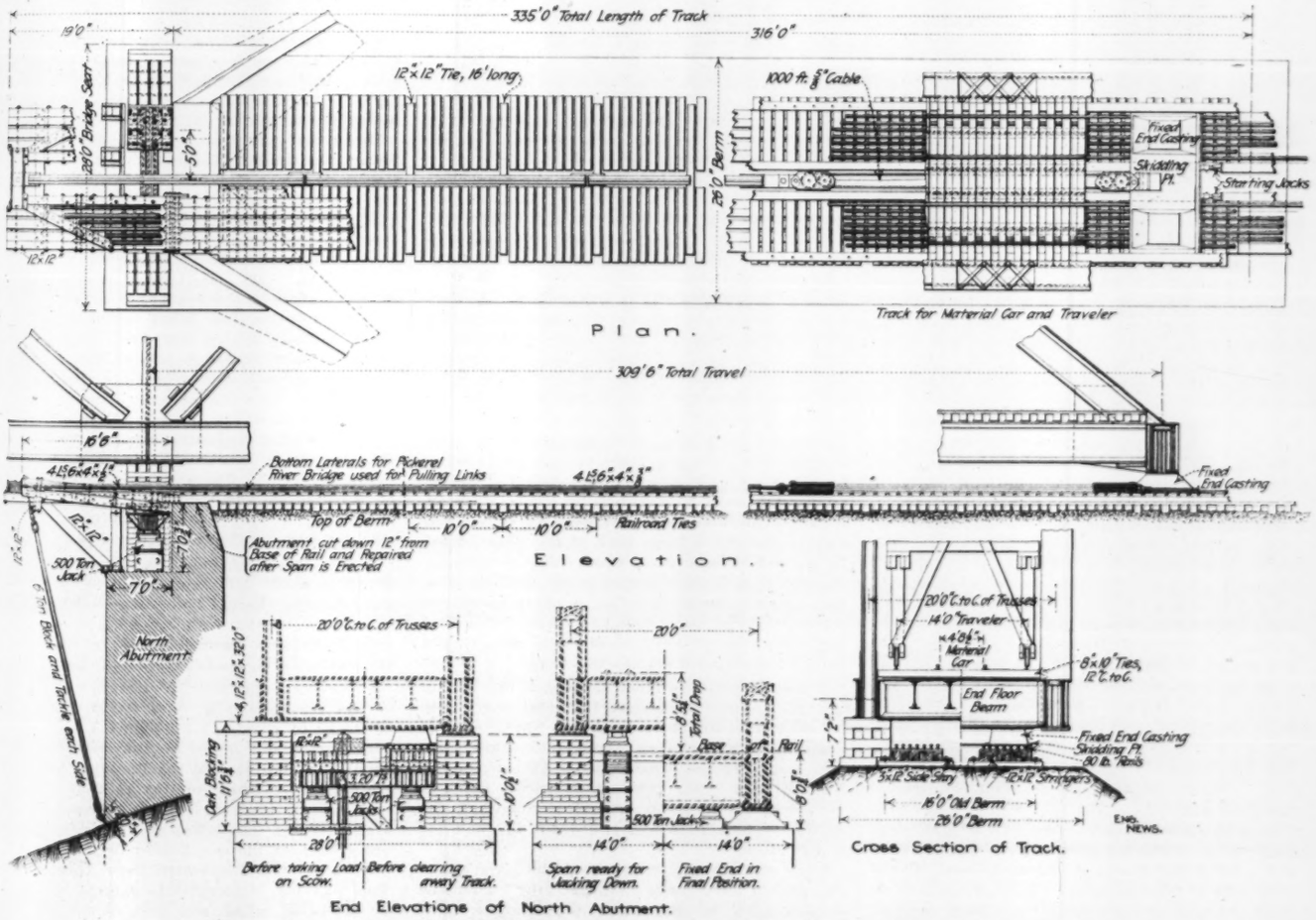


FIG. 5. SKIDDING TRACK AND JACKING LAYOUT IN ERECTION OF FRENCH RIVER BRIDGE.

It was built on shore, in the landward prolongation of its axis, in such a position that about a quarter of its length overhung the abutment. When the structure was completely riveted up, two scows lashed together were floated under the overhanging end, as close to the abutment as possible, and the bridge was jacked up on blocking on the scows. Under the inshore end of the truss were placed two eight-wheel trucks, running on tracks spaced about 25 ft. apart, the same as the spacing of the trusses. The position of trucks and scows was such that each truck took a load of about 180 tons, while each of the scows took about 242 tons of the total weight.

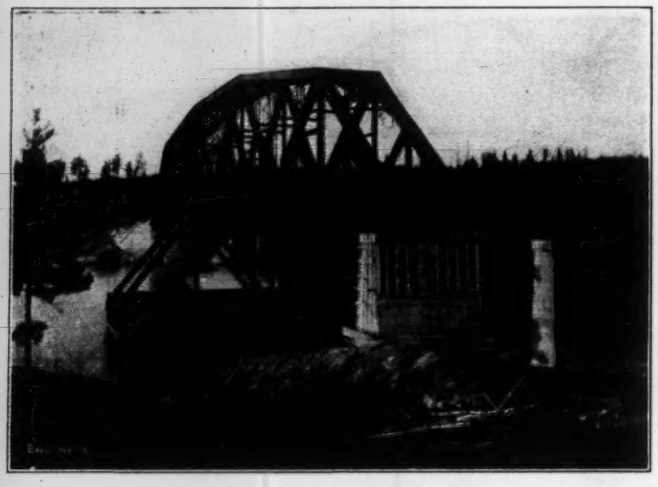


FIG. 6. BRIDGE IN PLACE BEFORE LOWERING ON BED PLATES.

The scows were set with their length parallel to the shore, to minimize the influence of the current, and they were anchored up and down stream by steel cables leading to capstans on the decks of the scows, which provided for exact guiding as they were pushed across the river. The bridge was pulled forward by cables handled by capstans and tackle blocks. The actual moving occupied about seven hours.

REMINISCENCES OF EARLY DAYS IN AMERICAN ENGINEERING; RECOLLECTIONS OF THE LATE RANDOLPH BRANDT LATIMER.

As our readers know, some of the most notable work of the first generation of American engineers was done in connection with the construction of the Baltimore & Ohio R. R. One of the engineers prominently connected with the work was Randolph B. Latimer. He was born July 26, 1821, and lived to advanced years, dying on Dec. 24, 1903. In 1898 he prepared at the request of his son some brief reminiscences of his early experiences in engineering work. We are indebted to this son, Mr. James Brandt Latimer, an engineer, of 209 Adams St., Chicago, for the privilege of publishing the following extracts from this paper.

We may preface them by referring to the fact that the late Chas. Latimer, of Cleveland, O., whose death occurred in 1888, was a relative of Randolph B. Latimer, both being great grandsons of Jacob Latimer (born 1708, died 1784). Jacob Latimer's father, James Latimer, emigrated to Maryland from England about 1690 and is said to have been of the same family as Hugh Latimer, the celebrated English prelate and reformer who suffered martyrdom at Oxford in 1555. A portrait and biography of Charles Latimer were published in our issue of April 7, 1888. The letter is as follows:

Bonnywood, Sept. 18, 1898.

My Dear Son:

In thinking over our conversation of last evening, and remembering your request that I write down my recollections of the early days of the Baltimore & Ohio Railroad, I have decided to do so to the best of my ability. You must remember, however, that some of the occurrences to which I shall allude, took place more than 60 years ago, and as I have no written record I am in many cases unable to give exact dates.

In Scharf's History of Maryland, it is stated that my grandfather, for whom I was named, was the Secretary of the first meeting of the Chesapeake & Ohio Canal, held in Annapolis in 1784, at which General Washington presided. My father was for many years manager of the stage coach line which operated between Baltimore and Washington, and at the time that the Baltimore & Ohio Railroad was projected, arrangements were being consummated to organize a through stage coach line from Baltimore to Charleston, S. C., with the object of ultimately extending it to New Orleans.

As a small boy I recall having heard this subject frequently discussed at my father's table. The rapid growth of railroads after the opening of the Baltimore and Ohio very soon destroyed the business of stage coaching, and the project was abandoned.

Taking into consideration my connection with the engineering department of the Baltimore and Ohio, which extended over a period of more than ten years, you represent the fourth generation of us which has been connected more or less closely with the transportation problems of the nation.

My father frequently took one or two of us children with him to Washington on the stage coaches of the line of which, as before stated, he was manager. This line operated over the Washington turnpike and was the only land connection between the North and the national capital and was well patronized, well equipped and profitable. My father was considered an excellent judge of horse flesh, and gave special attention to the purchase of the very best horses. The distance, 40 miles, was made in about four hours.

The vehicles were luxurious in their appointments, and I have often heard my father say that he had been told by foreigners and others who had traveled by it, that the whole line compared favorably with the best in England at that time.

My first recollection of the Baltimore & Ohio Railroad is walking out with my father on Sunday afternoons to watch the progress of the work on the Carrollton viaduct, so called from its being on or near the Carrollton estate of Charles Carroll, the signer of the Declaration of Independence, where the original line of the railroad crosses Gwynn's Falls.

At this time almost all rough labor was done by Irishmen, of whom there were a great many in Baltimore. The negroes were nearly all slaves and could only be secured by contractors by hiring them from their owners. As their labor was needed for a large part of the year on the farms and tobacco plantations, their owners demanded a good price for their hire, and as they, the negroes, were then, as now, incapable of performing the same amount of hard labor that may fairly be expected of a white man, it was more economical to employ the Irish.

About seven miles from Baltimore the line of the railroad first strikes the Elk ridge and a deep cut and high fill is made there. Quite a large camp of laborers were gathered at this point and some trouble started with the contractor. This led to a strike being inaugurated, which in turn resulted in more or less rioting, and the militia of Baltimore was called out to quell the disturbance.

Some wag promptly christened the place where the arrests were made "Vinegar Hill," after the famous place of that name in Ireland, a name which it bears to this day, and a street song was in everyone's mouth with a chorus [illegible] ich ran something like this:

"I'm all the way from Vinegar
I never worked and I never will."

This, I believe, was the first railr[illegible]trike in America.

My next recollection in connection [illegible] the railroad is of being taken on it by [illegible] ather to Ellicott's City, then called "Ellic[illegible] Mills." The railroad which had been comple[illegible] that far (16 miles) was being operated by [illegible]epower, the engine, which was ordered from [illegible]nd, not having been delivered at that time. [illegible]es were then changed at the Relay House, w[illegible] took its name from this fact, a name which [illegible]ll bears.

You have frequently heard yo[illegible] mother's friend, Mrs. Lea, whose father, De[illegible] Smith, was one of the first directors of the [illegible]timore & Ohio, tell in her inimitable way of t[illegible] experience with a party which was taken t[illegible] Ellicott's Mills" and back behind the engine [illegible] its trial trip; how their clothes and umbrellas [illegible] ruined by sparks thrown from the smokest[illegible] they being seated in an open observation [illegible] and how on the return trip when nearing Balti[illegible]re they overtook Mr. Jenifer driving a fine [illegible] on the turnpike alongside of the railroad; h[illegible] he, Mr. Jenifer, challenged them to a race into town, a race which he won owing to the slipping of a belt on the engine.

The early promoters of the Baltimore & Ohio Railroad Company were for the most part so-called Quakers, of whom there were a good many in Baltimore at that time, and nearly all of whom were prosperous merchants. They were shrewd men of business, worked in harmony with each other and were ever watchful to promote the best interests of the company.

Until 1838 I had attended private schools in Baltimore. I was an industrious student and apt in my studies, and had taken much interest in mathematics and right line drawing. I had drawn a large scale map of Maryland, for which I had been highly commended and which had been hung up in the school room.

Mr. Jonathan Knight, himself a Quaker, was at that time chief engineer of the Baltimore and Ohio. He was a friend of my father's, and hearing of my accomplishments at school, offered my father a place for me in his office.

My mother had died two years before and my father was thinking somewhat of removing from Baltimore. Mr. Knight's offer appeared tempting as offering me an assured start in life in a good and growing profession. So after some family discussions it was decided that I should accept it, and in August, 1836, when I was a little over fifteen years old, I went to work in Mr. Knight's office in the drafting room.

The road was then being operated as far as Point of Rocks on the Maryland side of the Potomac, a short distance east of Harpers Ferry, and was under construction from there to Harpers Ferry. You should bear in mind that this was the old main line through Ellicott's City, Mt. Airy and Frederick Junction, not the line through Washington to Washington Junction, now used as the main line. The line from the Relay House to Washington was then built and in operation, but there was no line from Washington west; this was not built until early in the '70's.

In the spring of 1837 I was sent to Harpers Ferry to assist Mr. John Small, who was resident engineer there. I had had good drafting room experience in Mr. Knight's office and at Harpers Ferry soon learned the use of the field instruments—level, transit, theodolite and compass.

I recollect going with Mr. Knight and an officer of the Chesapeake & Ohio Canal Co. to Point of Rocks to arrange for building a fence to prevent horses and mules on the tow path of the canal from falling into the Potomac River when frightened by trains on the railroad. The tow path was on the embankment between the canal and river, so that when trains came along the other bank of the canal, animals in shying away from them had frequently fallen into the river. This had led to complaints against the railroad by the canal, which was none too friendly to the railroad, as it was looking on it as a dangerous

rival. The question was finally settled by the railroad's building a fence, as before described.

I neglected to mention that the bridge had been completed across the Potomac River and that trains were running into Harpers Ferry at the time I first went there. A railroad—now the Valley Branch of the Baltimore & Ohio—had been built for a few miles along the Shenandoah and Harpers Ferry was the terminus for both roads.

The first bridge was not a success and was afterwards replaced by another one, the construction of which was under my charge. At this time Harpers Ferry was a thriving, prosperous town. The United States Government maintained a large arsenal and factory for small arms there, and it was the emporium for the rich valley of Virginia. Up to the time of the opening of the railroad and canal there had been considerable traffic in coal carried on the Potomac River. The mountaineers were a sturdy, enterprising race. Timber was plentiful and quite a business had grown up in building flat boats, called "Gondolas," as a satire on the Venetian pleasure boats, which were loaded with coal and floated down the river to Georgetown, where the boat and its cargo were both sold and the boatmen returned generally on foot. The cars first used on the railroad for the transportation of coal were named after these boats "gondola cars."

It was about this time that I first met Mr. Benjamin H. Latrobe. He was then quite a young man, but had been in the engineering department of the Baltimore & Ohio for some years. He had surveyed and built the Washington branch, the line from the Relay House to Washington, including the viaduct over the Patapsco River at the Relay House. This work had been carried to a successful conclusion and Mr. Latrobe was appointed to take charge of parties which were to survey the line from Harpers Ferry west to the Ohio River.

Mr. Small was put in charge of one of these parties and took me with him as an instrument man. We first ran several lines between Harpers Ferry and Cumberland and later west from Cumberland.

We were out through the winter of 1837-8, living for the most part in camp. The country between Harpers Ferry and Cumberland was well settled and improved. Martinsburg, Va., and Hancock, Md., were thriving country towns, and Berkeley Springs, Va., was a well known resort. West of Cumberland the country was sparsely settled. Deer and other game abounded and the inhabitants lived principally by hunting and trading in skins and ginseng which grew wild in the woods and was easily transported.

The party I was with ran the line from Piedmont to Altamont over the 17-mile grade. The gradient for this 17 miles was a steady ascent of 119 ft. to the mile. This part of the line was not built until after I had left the service of the Baltimore & Ohio, but I have always understood that it was built on the location which our party had selected.

The winter of 1838-9 I spent in Baltimore working up the field notes and preparing for the construction of the line. There had been some uncertainty as to whether the railroad would be continued west from Harpers Ferry on the Maryland (North) bank of the Potomac or on the Virginia (South) bank of that river. The original plan had been to build the road entirely in Maryland, that State having subscribed largely to the stock of the company, as had the city of Baltimore. The Chesapeake & Ohio Canal Co., which also had received aid from the State, was so antagonistic to the railroad company that it was decided to build from Harpers Ferry to Cumberland on the Virginia side. Remember there was no State of West Virginia at this time. I do not know whether any surveys had been made on the Maryland side further than observations with a view to location there, which I believe Mr. Jonathan Knight and Col. Long of the United States Army, who had been detailed by the government when the idea of building the railroad was first projected to conduct a preliminary survey, had made. I am quite sure that no work was done on the Maryland side after I first went to Harpers Ferry.

In the spring of 1839 construction of the railroad west from Harpers Ferry was commenced, and I returned there, having been appointed resident engineer in charge of the building of the new bridge across the Potomac. This bridge remained there until it was destroyed during the early part of the civil war.

Good stone for the piers was abundant in the vicinity and as there was a natural foundation of solid rock, the masonry work was easily accomplished. The superstructure was a wooden truss.

The years of 1839 and 1840 were years of financial distress and the construction of the railroad was not pushed very rapidly, although the work in the vicinity of Harpers Ferry went on steadily. My residency included, as well as the bridge, the construction of a long trestle to carry the railroad through the property of the United States Government occupied by the arsenal and several miles of the railroad westerly.

It was at this time, I believe, that I first met James L. Randolph, who had a residency adjoining mine.

Mr. Benjamin Latrobe, who had entire charge of the work at this time, so far as we were concerned, had profited by his experiences on the older parts of the road and the line from Harpers Ferry west was built on much better lines of construction than had been pursued earlier. Our orders were to lay out no curve with a radius of less than 1,000 ft., unless Mr. Latrobe had personally inspected the situation and had given orders to use a shorter radius. On the old line, curves of a very short radius had been used. There was one at Ilchester, between the Relay House and Ellicott's Mills, of little over 300 ft. radius, which was operated over until very recently.

The line was graded for double track. For a short distance west of Harpers Ferry the track was laid with two large timbers, hewed in the woods near by, laid longitudinally, then across ties on top of these, after which two smaller longitudinal timbers were laid on and spiked to the cross ties and the rails spiked to these last timbers. The whole thing was filled in with fine crushed stone. This was, I believe, experimental, as only a short distance was laid in this manner.

When I was on construction from Harpers Ferry to Cumberland—1839 to 1843—the so-called "Grasshopper" locomotives were in universal use. These as you no doubt remember (having seen two of them which were used as switch engines at Camden Station when you were a school boy), had vertical cylinders and boilers, the piston rods working on walking beams like a paddle wheel steam boat.

Several sorts of rails were used, at this time, a "U" rail, so-called, as the "T" rail is now, from the similarity of its section to that of the letter U inverted, also an "H" rail, so-called from a supposed similarity of its section to the letter H. This rail was intended to be reversible, so that when one side was worn down it could be turned over, and what had been the bottom turned into the top and an equal amount of wear obtained from it. This was soon found to be impracticable and the "T" rail adopted which is in service to the present time.

The winter of 1840-41 I spent with headquarters at Sir John's Run. James Randolph, who had the adjoining residency, and myself lived in a log cabin close to the railroad track where we kept house for ourselves. We each kept a horse and frequently rode over to Berkeley Springs. The hotel was closed for the winter, but a Mr. Strother, who conducted the hotel in the season, and his family were living there, and Randolph's acquaintance with them finally led to his marrying one of the young ladies.

The Doe Gully tunnel was on this residency, although special engineers were in charge of that work. This tunnel, if I am not mistaken, is about 7,000 ft. long.

During the summer of 1841 the work was pushed faster and many more contracts were let. At that time money for purposes of exchange was very scarce in this region and contractors' scrip was in common circulation; the railroad company, too, issued its own notes which circulated freely.

In the winter of 1842-3 the road was completed into Cumberland. There was still a great deal of work to be done, and Randolph and I were kept on, though a great many of the engineers were discharged, through the summer of 1843 and winter of 1843-4. It was decided not to extend the road west from Cumberland at that time, and during the summer of 1844 I was advised that my services would be no longer required, though Mr. Latrobe was kind enough to promise me a position again as soon as the work was resumed.

James Randolph was also out of employment, and we decided to invest our savings, which amounted to quite a little, in a stock of merchandise and to start a store at Patterson's Creek. This we thought would keep us in touch with the operations on the railroad and would afford a livelihood while we were waiting. This project was successful beyond our wildest expectations and the business soon grew to be very profitable—in a small way, of course, as our capital invested was comparatively small. We lived in the store and kept house for ourselves.

In 1846, the business had grown so that we found we must have a Baltimore agency. I went there to arrange for this, and on making inquiries was recommended to Mr. Robert Garrett, who had a store on Howard St., between Fayette and Baltimore Sts., where he was in the business of stocking the "Conestoga" wagons, which in those days still plied between Baltimore and Pittsburg over the National Turnpike. His son, John W. Garrett, who was afterwards president of and virtually owned the Baltimore & Ohio, was conducting this business. They were very anxious to make arrangements with us, but after talking it over with Randolph, we decided to establish a house in Baltimore ourselves, so I rented the building at 66 South St., where my office remained until I gave up business, and we started up under the firm name of Randolph & Latimer. I removed to Baltimore while Randolph stayed at Patterson's Creek. In 1847 the construction of the railroad west from Cumberland was resumed and true to the promise made to us by Mr. Latrobe, we were invited to return to the service of the railroad.

Our business was doing so well, however, that we did not feel justified in abandoning it, so we decided to sell the Patterson Creek business, after which I continued with the Baltimore house and Randolph returned to the railroad, where he eventually rose to be Chief Engineer and later Consulting Engineer. This ended my connection with the Baltimore & Ohio.

When I started with that company, no engineering work of any such magnitude had ever been attempted in this country. What private engineering had been done was on canals and highways. Harbor and fortification work had been supervised by the officers of the engineer corps of the army. There was no school or college in the country except the West Point Military Academy where engineering was taught, and that school had been opened only a dozen years when work on the Baltimore & Ohio was first started. We had no text books and no past experience to guide us. Each of us kept private notes and worked out his own formulas. The winter that James Randolph and myself spent at Sir John's Run, he and I tabulated a vast quantity of such notes and formulas. It was from such work as this that Trautwine and Charles Latimer compiled text books for the use of young engineers.

Much of our work probably was done by methods that would be called crude to-day. Our curves, for instance, were laid out by offsets from a tangent, which I am told is not done now.

All the men with whom I was associated were honorable, conscientious and hard-working, and some of them blessed with brilliant minds. When your mother's brother, Mr. James Preble Wormeley, who had studied engineering in the office of the famous Isambard Kingdom Brunel—the greatest English engineer then living—and had

had several years' experience in building English railroads, came to this country, he was appointed for a short time chief engineer of the Baltimore & Ohio, and on leaving made the statement that the engineer corps of that railroad was the finest body of engineers then in the world.

REINFORCED-CONCRETE CONDUITS FOR ELECTRIC CABLES; LONG ISLAND R. R.

By FREDERICK AURYANSEN,* Assoc. M. Am. Soc. C. E.

A unique example of conduit construction is afforded in a length of about 1,150 ft. of vitrified duct conduit on concrete piles, recently built for the Long Island R. R. under its tracks in the new North Shore Freight Yard at Long Island City, the rearrangement of tracks necessitating the reconstruction of this section of conduit. The area occupied by this yard was, until last year, a salt marsh, and except where filling had been done for city streets or to support railroad tracks, the soft quaking muck was about 30 ft. deep. The original conduit line, which was of 18 ducts, in six horizontal rows of three each, and enclosed by a 4-in. plain concrete casing, was built in this muck on a thin bed of concrete and no troubles had ever ensued from the instability of the foundation; but it was considered unwise to reconstruct the line across this treacherous spot without taking adequate measures to secure its stability and permanency; for the operation of the electric zone of the L. I. R. R. depends entirely upon the 11,000 volt current transmitted through this conduit line from the power-house at Long Island City.

Various supports were suggested, but the choice finally lay between a support of plain concrete upon closely spaced wooden piles, and one of reinforced concrete upon widely spaced concrete piles. The former would have required a trench 10 to 13 ft. deep in very wet muck in order to keep the tops of the piles below the probable permanent ground water level, and as it was desirable to locate the ducts as high above the present ground water level as possible, in order to avoid the difficulty and expense of drainage during construction, a large and expensive intermediate mass of concrete would have been required,—the wooden piles being of course permanent construction only when immersed. On the other hand, by the use of concrete piles the trench had to be but 6 ft. deep; the most difficult part of the excavation was thus avoided, the quantity of concrete reduced to a minimum, and the progress of the work was hence facilitated accordingly, a highly important factor in the middle of December, 1907, when the work began. It was completed Feb. 25, 1908.

*Assistant Bridge Engineer, Long Island R. R., Jamaica, N. Y.

The point of departure of the new line from the old is at the intersection of the old line and a new wing wall on Sixth Street, about 200 ft. north of the proposed new viaduct which is to carry Van Alst Ave. over the North Shore Yard tracks. (Fig. 1.) From a new manhole at this point, the conduit is carried on a shelf on the back of the wing and abutment walls for about 250 ft., where the concrete pile support begins; as a transition from solid abutment to long reinforced beam spans, the first two spaces are about 14 ft.; then come four standard spaces of 20 ft. to manhole 12. The beam section between manholes 12 and 16 contains an 8-in. drain pipe, which leads to a sump near manhole 16, whence the water is pumped into an adjacent sewer. During construction, and for some time after the completion of the conduit, there was a large flow of ground water through this drain pipe, but it had almost ceased early in April. Each manhole is supported by four concrete piles, which are bonded to the floor of the manhole by six rods, bent as shown.

The reinforced-concrete beam which supports the conduit is 26 ins. wide and 28 ins. deep, and is designed to sustain (with a safety factor of four), a uniform dead load, including its own weight, of 2,040 lbs. per lin. ft., and a live load of 6,000 lbs. concentrated at the center. It is assumed as continuous over supports, the maximum bending moment being taken at ¾ of that existing in a 20-ft. simple span. The reinforcement consists of ⅝-in. square twisted rods, which, for the sake of uniformity, are of the same number and arrangement for all spans. In the bottom of the beam there are eleven rods, of which five are straight and six are bent up at 45°, passing over the piles as top reinforcement; there are also three straight rods in the top of the beam. In addition to the six main bent rods the web is reinforced by U-stirrups 2 ft. apart, which pass under the bottom rods and extend 1½ ft. above the top of the beam in order to connect the beam to the 4-in. concrete sheath. In the top of the latter are three longitudinal rods and inverted U-stirrups are placed midway between the beam stirrups. The additional strength secured by bonding together the beam and conduit sheath was not considered in the design. Typical beams are shown in Fig. 2 and a typical manhole in Fig. 3.

The concrete is a 1:2:4 mixture with ¾-in. broken stone, and was laid very wet, the sheet piling taking the place of forms. Seventy-six unreinforced Raymond concrete piles with 6-in. points and 20-in. butts and about 21 ft. long were used; the cores were driven until the penetration for the last four blows was not over ½ in., or practically to refusal.

The design was made and the details were developed by the Engineering Department of the Long Island R. R., under the direction of Mr. J. R. Savage, M. Am. Soc. C. E., Chief Engineer. The Abbot-Gamble Co. were the contractors for the work.

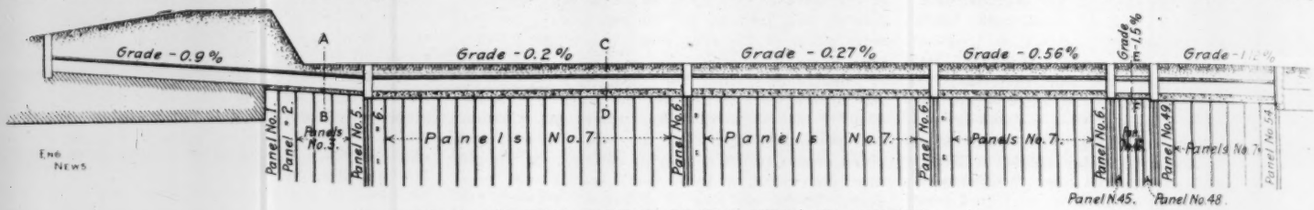
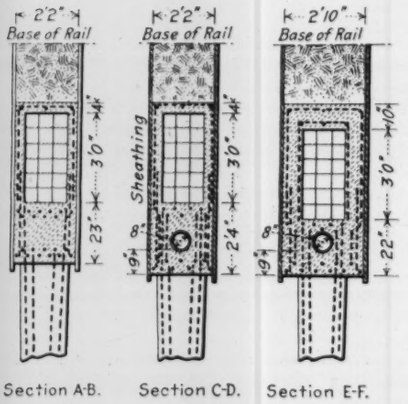


FIG. 1. GENERAL LAYOUT OF THE CONDUIT SYSTEM.



SALARIES OF TECHNICAL GRADUATES.

By WALTER B. SNOW, M. Am. Soc. M. E.*

In Engineering News, Feb. 6, '08, the writer presented an analysis of the salaries of certain technical graduates. This was based upon returns received from members of a single class from one of our leading technical schools ten years after graduation. Similar returns have just been made available by a class which graduated five years ago from the same institution. A comparison of results is interesting. The average salary of the class ten years out was shown to be $3,107, and that of the median man—i. e., the 76th man in a class of 128—to be $2,500. In the case of the later class graduated years after graduation the figures are $2,115 and $1,800. In detail the returns are as follows:

				Graduates.	Non-graduates.
Below	$1,000	per	year	1	4
Between	1,000	and	1,199	9	2
Between	1,200	and	1,399	15	11
Between	1,400	and	1,599	20	10
Between	1,600	and	1,799	15	4
Between	1,800	and	1,999	28	6
Between	2,000	and	2,249	17	6
Between	2,250	and	2,499	7	9
Between	2,500	and	2,999	6	10
Between	3,000	and	3,999	12	5
Between	4,000	and	4,999	2	2
	5,000			3	2
Above	5,000			1	1
				128	64

A general summary shows:

	Grads.	Non-Grads.	Total.
Gross Salary	$273,000	$134,080	$407,080
Average Salary	2,133	2,095	2,115
Least Salary	900	750	...
Greatest Salary	7,500	6,500	...

It is shown that a man getting $6,000 or $7,000 a year tends to raise the average much more than it is lowered by a man who receives only $800 or $1,000. A fair average seems to be that received by the 96th man—half way between No. 1 and No. 192. This gives $1,800, which is the amount reported by 24 men.

The non-graduates represent exactly one-third of the total number from which reports were received. While the average received by individuals in each group varies but little, it is noticeable that the graduates group near the average point, while the non-graduates group lower. The fact of non-graduation may mean merely that a man specialized, but that his scholarship standing was fully equal to that of the graduates, or that he failed to secure his degree, or pursued but a portion of the course and left to enter business before the balance of the class graduated. Under the latter condition he would have the advantage of an earlier start upon his career as against a possible deficiency in technical knowledge.

Reports of smaller local groups in the same class ranging from 18 to 60 men which have been collected annually indicate the following:

Time after graduation.	Average salary.
8 months	$793
1 year	1,073
2 years	1,200
3 years	1,343
4 years	1,571

The difference between the figures received four years after graduation from the small group (only 30 men) and those from the more widely spread group of 192 men secured five years after may tend to show that the men who scatter, as a whole, make better salaries than those who remain near the home institution in the East. This appears to be roughly confirmed by the fact that the later returns received through the mail—those from distant points—averaged better than the ones first tabulated.

The returns cast an interesting side light upon permanency of position in the case of recent technical graduates. The following facts appear:

Number of men who have held but 1 position	52
" " " " " " 2 "	50
" " " " " " 3 "	36
" " " " " " 4 "	28
" " " " " " 5 "	14
" " " " " " 6 "	6
" " " " " " 7 "	4
" " " " " " 8 "	1
" " " " " " 9 "	1

Only 26 men, or one in seven, have changed more than three times, while 52 men still remain where they first started, their average sal-

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ary be[illegible] $2,051—slightly lower than the general a[illegible]age. When there are deducted from this g[illegible]p those who receive somewhat abnormal sa[illegible]ies, the average drops to $1,800, considerab[illegible] below that of the class. On the other hand, [illegible]usual frequency of change in position appear[illegible]o result in a drop below the average—26 me[illegible] who have held five or more positions averaging $1,922, only two of the number earning over $2,500.

Out of the total of 192 men, 111 are following the lines of their course, 53 are in work related to their course and 28—less than 15%—report that they are making no use of their professional studies.

As class statistics the preceding appear to be unusually reliable. Coming as they do from men graduating from a dozen or more courses, and scattered the world over, they present a fair average of the financial returns secured in varied industries and professions by the technical trained men five years after leaving college.

CIVIL ENGINEERING A CLOSE PROFESSION IN LOUISIANA.

The first State in the Union to limit by law the practice of civil engineering is Louisiana. The Legislature of that State has just enacted a law establishing a State Board of Engineering Examiners, authorized to issue certificates of competency to persons desiring to practice as civil engineers. We reprint the law in full below and note especially that all who were actually practicing civil engineering or surveying prior to the passage of the law are exempt from its provisions. It is of interest to note also that the applicant for a certificate of competency as a civil engineer is to be examined in "Geometry, Trigonometry, Land Surveying, Use of Instruments and Physics."

We are informed that the law had the endorsement of the Louisiana Engineering Society, and that a committee of that society was instrumental in securing the passage of the law by the Legislature. The text of the law is as follows:

An Act to regulate the practice of Civil Engineering and Surveying; to create a State Board of Engineering Examiners, and regulate the fees and emoluments thereof; to prevent the practice of the said callings or professions by unauthorized persons; and to provide for the trial and punishment of violators of the provisions of this act by fine or imprisonment; and to repeal all laws or parts of laws in conflict or inconsistent with this fact:

Section 1. Be it enacted by the General Assembly of the State of Louisiana, that, from and after the promulgation of this act, no person excepting those already engaged under existing laws in the practice of Civil Engineering and Surveying, shall practice the said callings or professions within the State of Louisiana, unless such person shall possess all the qualifications required by this act.

Sec. 2. Be it further enacted, etc., that after the promulgation of this act, any person, before entering upon the practice of Civil Engineering or Surveying, shall present to the Board of Engineering Examiners, as hereinafter constituted, a diploma from an Engineering College or School of good standing; said standing to be determined by the Board, or shall pass a satisfactory examination before the Board upon the following, to wit:

For Surveying.—Geometry, Trigonometry, Land Surveying, Practical Use of Instruments.

For Civil Engineering.—Same as Surveying, in addition thereto Natural Philosophy or Physics.

The person shall also satisfy the Board that he is 21 years of age, of good moral character, and possesses at least a fair primary education. If said diploma or examination are satisfactory to the Board they shall issue to such person a certificate in accordance with the facts.

Sec. 3. Be it further enacted, etc., that the Engineering Examiners shall consist of a Board of five members, three of whom shall constitute a quorum for the purpose of holding examinations and granting certificates. All members shall be practicing Civil Engineers or Surveyors of good standing. The certificate of the Board shall be conclusive proof of the efficiency of the applicant. All examinations held by the Board and answers of applicants shall be in writing and shall be filed and kept as records. All members shall be appointed by the Governor of the State from a list presented by the Louisiana Engineering Society, and the Governor shall have the right to remove any or all members thereof for inefficiency or neglect of duty, and to fill all vacancies occurring in the Board from names recommended by the Louisiana Engineering Society.

Sec. 4. Be it further enacted, etc., that the first Board of Engineering Examiners appointed under this act shall meet and organize within thirty days from the date of their appointment, and shall name one member to serve two years, one to serve three years, one to serve four years, one to serve five years and one to serve six years, to be decided by lot or agreement among themselves as to their respective terms.

At the expiration of the above terms, each member shall be appointed by the Governor for a term of six years from names recommended by the Louisiana Engineering Society.

Sec. 5. Be it further enacted, etc., that all persons practicing Civil Engineering or Surveying in the State of Louisiana before the passage of this act, shall within ninety days after its promulgation, register as such practitioners with the Clerk of the District Court of the Parish within which they reside, and upon the appointment of the Board of Engineering Examiners, shall notify the said Board of such registration.

Sec. 6. Be it further enacted, etc., that to prevent delay and inconvenience any one member of the Board may grant a permit to practice after a satisfactory examination of any applicant, and shall report thereon to the next regular meeting of the Board. Said temporary permit shall not continue in force longer than until the next regular meeting, and shall in no case be granted less than six months after the applicant has been refused a permit by the Board.

Sec. 7. Be it further enacted, etc., that all certificates issued under Section 2 of this act must be recorded in the office of the Clerk of the District Court of the Parish in which the applicant resides, who shall make recordation thereof in a book to be kept for this purpose only, and who shall certify to said recordation by endorsement on original certificate which the holder shall then deliver or transmit to the Board of Engineering Examiners. The fee which the Clerk is entitled to charge for such recordation shall be one dollar. Said certificate entitles the holder to be placed on the list of regular Civil Engineers and Surveyors, the publication of which is hereinafter provided for. The Board of Engineering Examiners shall preserve the certificates, and a copy signed by its secretary shall be received as evidence in courts. Until recordation of said certificates, the holder shall not practice Civil Engineering or Surveying in the State of Louisiana.

Sec. 8. Be it further enacted, etc., that the Board of Engineering Examiners shall publish annually a complete list of registered civil engineers and surveyors, with their residences, in a daily paper of the City of New Orleans, and such published list shall be received as evidence in court that the names it contains are duly registered.

Sec. 9. Be it further enacted, etc., that the members of the Board of Engineering Examiners shall receive in compensation for their duties, Ten dollars per day during the session of the Board, together with their hotel bills and their traveling expenses by the most direct route to and from their respective residences. The same to be paid out of any moneys in the treasury of the Board, upon the certificate of the president and the secretary. The Board is empowered to demand a fee of One dollar for issuing a certificate, and of Ten dollars for examination; if the applicant fails to pass, and no certificate is issued, Five dollars of his fee is to be re-

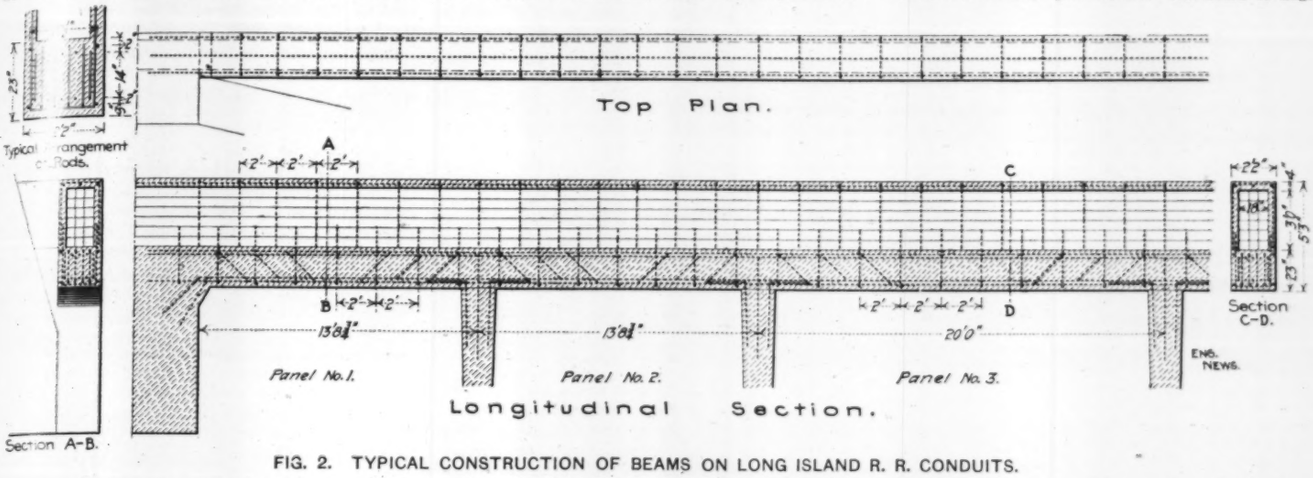


FIG. 2. TYPICAL CONSTRUCTION OF BEAMS ON LONG ISLAND R. R. CONDUITS.

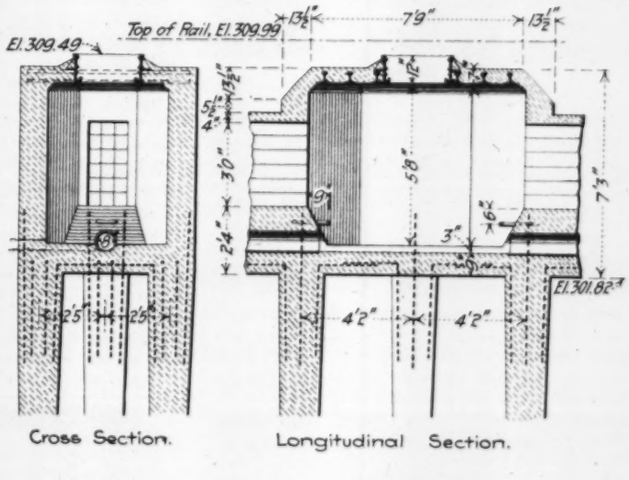


FIG. 3. MANHOLE ON REINFORCED-CONCRETE CONDUITS FOR LONG ISLAND R. R.

tained. The fee for a temporary permit shall be Five dollars, and is to be credited to the applicant when he applies for a permanent permit.

Sec. 10. Be it further enacted, etc., that any person who shall practice or attempt to practice the profession or calling of a Civil Engineer or Surveyor, without having complied with the provisions of this act, shall be fined not less than Twenty-five dollars, nor more than One Hundred dollars, or shall be imprisoned not less than thirty nor more than ninety days, for each offense by any court of competent jurisdiction.

Sec. 11. Be it further enacted, etc., that the Board may revoke any permit it has issued, when its holder has been convicted of immoral conduct before a competent court.

Sec. 12. Be it further enacted, etc., that this act shall not apply to the Engineering Departments of the United States, nor to the Civil Engineers and Surveyors of other States and Territories, when in actual consultation with registered Civil Engineers or Surveyors of this State, nor to any Civil Engineer or Surveyor of this State actually practicing such profession or calling before the passage of this act.

Sec. 13. Be it further enacted, etc., that the Board of Engineering Examiners shall make annual report to the Governor of its transactions, with such recommendations for the advancement of the service as it may think best.

Sec. 14. Be it further enacted, etc., that all laws or parts of laws in conflict with this act be and the same are hereby repealed.

CONCRETE PILE FOUNDATIONS FOR A PARIS RAILWAY BRIDGE.

An interesting variation of an ordinary type of bridge pier was used in founding a new bridge built by the Compagnie des Chemins de Fer de L'Ouest of France at Asnières, where four of the company's lines diverge from the trunk leaving Paris. The railway crosses the Seine at this point on a four-track deck girder bridge of five 102-ft. to 107-ft. spans, built in 1851. Increasing traffic made this number of tracks inadequate in recent years, and six tracks became necessary.

Whether to build a new six-track bridge or to retain the old bridge supplemented by two new tracks on an added structure was the first question to be decided. The old bridge was not designed for present-day loads, but it had been designed with much care, under Mr. Eugene Flachat, then Chief Engineer of the company, and it showed no weakness. Extensometer tests made on various parts of the structure in 1893, by Mr. Rabut, showed that the actual stresses were much below those shown by calculation. The successive spans are continuous, but this was doubtless considered in the design. On the other hand the reinforcement of the upper flange of the girders by the floor-plating riveted to them, and the reinforcement of the bottom flange by the crossed diagonals of the wind-bracing, undoubtedly had much to do with the discrepancy between calculated and observed stresses. Moreover the four tracks of the bridge (on five girders) would probably never receive their live-load simultaneously, and the sway-bracing between the girders would make them deflect together sufficiently to relieve the loaded girders and thus make the actual stresses smaller than the calculated. At any rate the observations indicated that the bridge was strong enough, and in fact should be classed as one of the strongest bridges on the company's lines. It was therefore decided to retain the four-track bridge and build a new double-track bridge alongside. In order to prevent disturbing the foundations of the old bridge by the new work, the latter was so located as to leave a clear space of 6 to 8 ft. between the adjoining piers (Fig. 1).

The span lengths of the new bridge were made the same as the existing spans, and the superstructure follows closely to the old one in general arrangement. The four girders, one under each rail, are deck girders of the same depth, 86 ins., but they are of I-section instead of the box section of the old girders; the flanges are 25½ ins. wide across the cover-plates. They have very stiff sway-bracing, to take full advantage of the relieving action of adjacent girders upon each other. The lower lateral system is designed with diagonals of increased section, to fit them for sharing proportionately in the bottom-flange tension. A $^{15}/_{16}$-in. floor-plate is riveted continuously over the girders, taking the place of the inner cover-plate. A width of 39 ins. of this floor-plate is included in the calculations as top flange area.

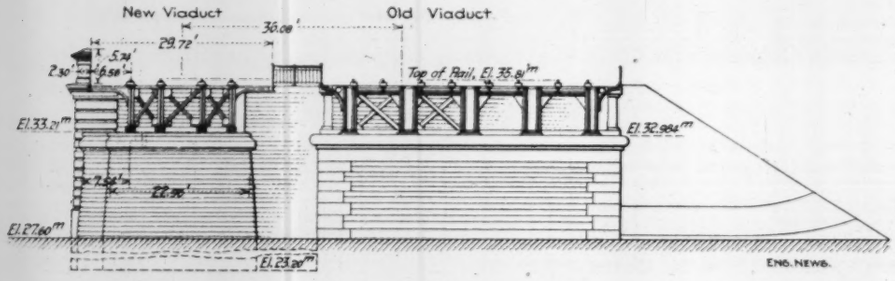


FIG. 1. CROSS SECTION THROUGH OLD AND NEW BRIDGE OVER THE SEINE, ASNIERES, FRANCE.

The girders rest on fixed bearings at both ends, as the observations of the company's engineers indicate that roller bearings lose their mobility in a very short time.

The piers, whose foundation is the most distinctive feature of the structure, are represented typically in Fig. 2. They are of concrete faced with cut-stone masonry from a point 20 ins. below low water. The under-water part is of mass concrete deposited in water inside a reinforced-concrete box or caisson serving as form. The base rests on a foundation of reinforced-concrete piles.

The piles, designed to carry 55 tons each, are octagonal in section and are not tapered but straight; they measure 12 ins. in diameter across flats and are 20 ft. long. The reinforcement is a spiral of $^{7}/_{16}$-in. round iron 1½ ins. in pitch, surrounding eight longitudinal $^{7}/_{16}$-in. rods wired to the spiral. Fig. 3 illustrates the process of assembling the reinforcement. The spiral was first wound with close turns on a wooden mandrel 10 ins. in diameter—the interior of the reinforcement. When stripped the mandrel, it was slipped over the lo... rods and the turns were then spread to ... spacing by wooden wedges. The l... rods were finally wired to the spiral ... intersection, which made the reinfor... solidly assembled unit. A pile-shoe a... seen in Fig. 3 was wired to the botto... the longitudinal rods.

The piles were molded in wooden for... zontally, and were stored for a mont... driving. In driving, the hammer was ... on the pile direct, without cap or cushi... soil of the river bottom is sand and gra... lying strata of shale on which the pi... The piles were proportioned for a load of ... per sq. in. on the concrete, plus 11 ... moduli) times the oblique section of t... multiplied by 2.40, the assumed efficie... as compared with longitudinal steel.

The piles were driven, in the proper l... flush with the river bottom, and then ... reinforced-concrete pier forms, previously ... on shore, were floated over them and ... position with the help of guide timbers.

Fig. 4 shows the construction of these pier-forms or caissons so fully that no further description is required. They were made of a 1:2:4 mixture, while the piles were of a mixture slightly richer in cement. The view, Fig. 5, shows one of these forms completed and another in course of concreting. In floating the form to place, a temporary wooden bottom was put on. When the form was properly sunk over the piles, resting on the river bottom by the broad ledge at the lower edge of the form, its top edge was about 8 ins. below water-level. The interior was then filled with concrete deposited in water, up to a level 20 ins. below water. The remainder of the pier was built up in the dry, the top edge of the form being fitted with wooden sheeting rising above water-level, for this purpose.

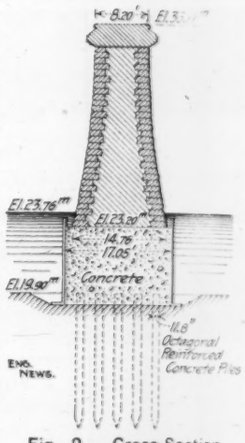


Fig. 2. Cross-Section Through Pier for New Asnieres Bridge, Showing Reinforced-Concrete Piles and Pier Forms.

We are indebted for the information and the illustrations used for this article to Mr. Réné Bonnin, of Paris, France.

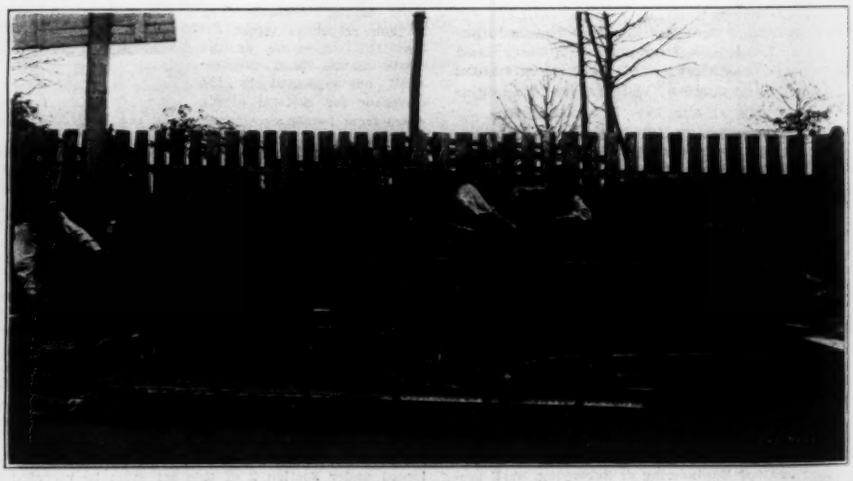


FIG. 3. ASSEMBLING THE REINFORCEMENT FOR HOOPED PILES FOR NEW BRIDGE AT ASNIERES.

COAL DUST AS A FACTOR IN MINE EXPLOSIONS.

A paper with the above title was read before the Coal Mining Institute of America at Greensburg, Pa., on June 8, by Henry M. Payne, Professor of Mining Engineering at West Virginia University, Morgantown, W. Va. We reprint the summary of conclusions given by Mr. Payne as follows:*

1. Granting that secondary explosions may be propagated indefinitely by the larger sizes, only coal dust which will pass through a No. 100 screen is capable of initial, or primary, explosion.

2. Such dust after having been subjected to ordinary atmospheric air for only a few hours, becomes largely decomposed, and exists as a bubble of constituent gases, whose film is composed of undisintegrated carbon and impurities, which after combustion are known as ash.

3. Such dust, when suspended in a homogeneous cloud, with a moderate air velocity, is susceptible of ignition either through shock, compression, or sufficient heat to inaugurate combustion.

4. Such results will be classified as combustion or explosion, depending upon the volume of dust ignited, its supply of oxygen, and the space within which combustion takes place.

5. Where gas alone is ignited, and the mine is free from dust, a "high explosive" effect is obtained, and the explosion may be strictly local, due to the cooling effects of the walls.

6. The chief product of a dust explosion is carbon monoxide, whose expansion under combustion is greater than that of methane, and which receives its continuous supply of oxygen by feeding toward the intake.

7. A dust explosion, while assisted by the intake air, must nevertheless follow those entries or airways furnishing the most material upon which to feed, and when this course follows the return airways, the conversion of the carbon monoxide to carbon dioxide renders the air extinctive, and prohibits further propagation. Evidence of such a condition will be found in the coke splashing, or crusts, formed by the deposit of red-hot cinders, carried by the air wave, and testifying to the incomplete combustion.

8. The initial explosion may and generally does, distil so large an amount of gas that complete combustion is impossible at the site of distillation, and this mass of gas and dust, in varying stages of ignition and combustion at a temperature greatly in excess of the point of ignition were sufficient oxygen present, will develop into local explosions at irregular intervals, wherever adequate atmospheric oxygen is available, such as at junctions of airways, widened passages for side tracks, or cavities where falls of roof rock have occurred, and are frequently called "flame areas."

9. When such an explosion, either primary or secondary, travels toward a dead end of an entry or passage, the compression generated by its expansion and momentum causes an almost incredible rise in temperature, sufficient to distil the various hydrocarbons from even the ribs of the coal itself, and supplementing it with a heat potential far in excess of its losses through radiation and expansion.

10. The liability of any coal dust to explosion increases almost directly with its percentage of volatile combustible matter, i. e., the quotient of its percentage of volatile matter divided by the sum of the percentages of volatile matter and fixed carbon.

11. While coal dust alone, under the conditions enumerated, is distinctively explosive, the presence of even the smallest amount of methane augments materially the susceptibility to ignition.

12. On account of the great elasticity of air, it is highly probable that no proper conception has yet been attained, of the almost incredible speed with which a dust explosion, through its gaseous products, may be extended to far distant portions of a mine, under the force of initial expansion, properly called the "percussive theory."

13. Changes in barometric pressure only affect the liability to explosion in so far as they allow, when the barometer is falling, a settling of any possible accumulation of methane from a dome in the roof rock, into the ventilating current; but such small quantities of gas are infinitely safer when diffused in the current of air than when concentrated in one place.

Moreover, even if we grant that a low barometer allows greater occlusion it also allows easier ventilation for the diffusion of such occlusion.

14. A mine may be overventilated until the air-current has such a velocity that it stirs up dust, and would feed any slight ignition which might take place and otherwise die out.

15. The difference in the amount of real dust made by either air punchers or electric-chain machines is so slight, and so variable, depending on the nature of the coal and the skill of the machine man, that it cannot be said that either machine, as a class, creates more dust, one than the other.

16. The results of experiments with electric ignition of dust show that the danger from electric wiring is no greater than that of stirring up a cloud of dust from a broken air pipe or a loose connection.

17. Coal dust cannot be made wet, in the usual sense. The method used by superintendent Butler is indicative of the best results, but even then it is hypothetical if the most careful system of watering is not merely an infinitesimal portion of the "ounce of prevention," and it is an open question whether it is not positively detrimental.

18. While the abolition of all explosives, as recommended by the Belgian authorities, appears unnecessary and impracticable in this country, yet the greatest field of investigation now lies along that line, and only those explosives carefully tested, and known to be uniformly prepared, by well known and responsible manufacturers, should be used. The maintenance of a testing laboratory even though on a small scale, and the employment of a competent chemical engineer, should be undertaken at every coal operation of commercial importance.

*The complete paper is published in the "Engineering and Mining Journal" of July 4, 1908.

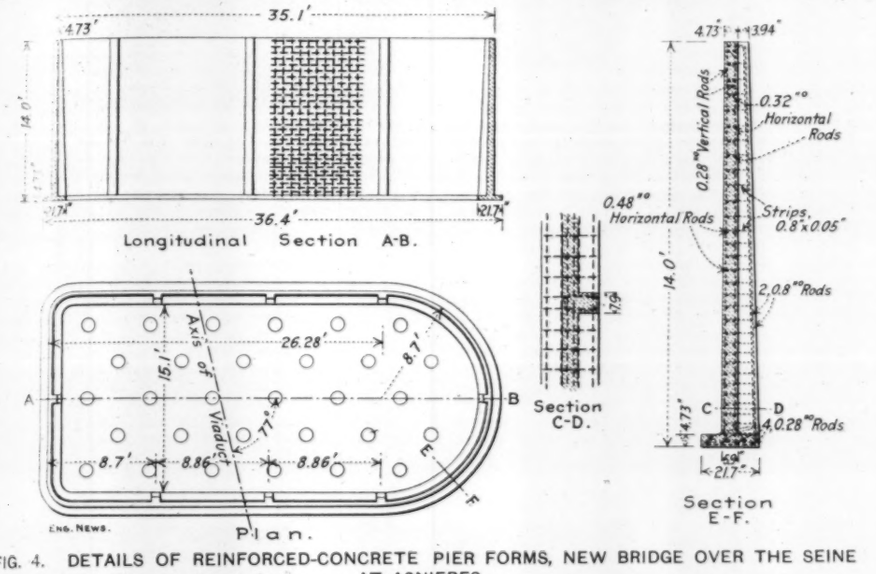


FIG. 4. DETAILS OF REINFORCED-CONCRETE PIER FORMS, NEW BRIDGE OVER THE SEINE AT ASNIERES.

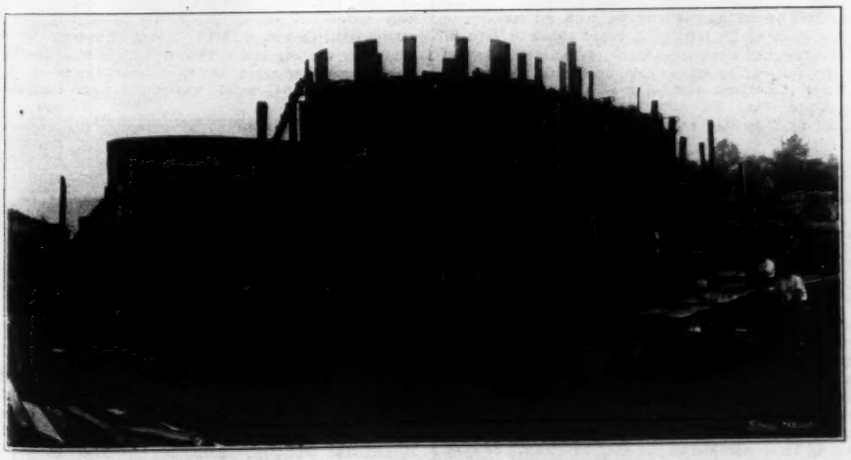


FIG. 5. TWO REINFORCED-CONCRETE PIER FORMS FOR NEW RAILWAY BRIDGE AT ASNIERES.

THE AVAILABLE SUPPLY OF UNMINED COAL IN Pennsylvania is discussed as follows in a press bulletin issued by the U. S. Geological Survey:

Mr. M. R. Campbell, of the U. S. Geological Survey, estimates the amount of coal originally in the anthracite fields of Pennsylvania at 21,000,000,000 short tons and that in the bituminous fields at 112,574,000,000 short tons. It is said that, by the methods of mining anthracite coal in former years, for every ton of coal mined and marketed 1½ tons were either wasted or left in the ground as pillars for the protection of the workings, so that the actual yield of the beds was only about 40% of the contents. This percentage of waste has now been materially reduced, but the exhaustion to the close of 1907 has probably amounted to about double the production, or 4,000,000,000 short tons. This would leave still in the ground approximately 17,000,000,000 tons, which would be capable of yielding, at the rate of one ton of coal lost for each ton mined, 8,500,000,000 tons, or approximately 100 times the quantity of anthracite produced in 1907.

If we estimate for the bituminous production 1 ton of coal lost for every 2 tons mined, the exhaustion to the close of 1907 has been 2,760,000,000 tons, which would leave still in the ground in Pennsylvania a little less than 110,000,0000,000 short tons of bituminous coal. The annual production and consumption of coal will no doubt continue to increase, but at the rate of production reached in 1907 the available supply in Pennsylvania would last about 490 years.

A STOPE DRILL COMPETITION will be held in the Transvaal during 1909 with the object of finding a small drill capable of economic use in the narrow stopes on the Witwatersrand. After the elimination by preliminary trial of such machines as are obviously outclassed or unsuited to the local mining conditions, the balance, reduced to manageable number, will undergo a test of 300 consecutive shifts, excepting Sundays and legal holidays, under conditions which in every way conform to regular mining practice in the district. They will be set up in stopes varying in width from 20 ins. to 48 ins., and with a dip of from 20° to 90°. About 90% of the holes will be down-holes. It is anticipated that most of the machines entered will use compressed air, but drills with any other form of motive power will be eligible. Air pressure may range only between 60 and 75 lbs. per sq. in. at the end of the pipe line as shown by recording gages. As the need of the local mining industry is for a one-man machine, no entry weighing over 100 lbs. will be accepted and even lighter ones are most desirable. All holes must reach 42 ins. in depth to be counted, except under such circumstances as may be specially authorized by the managing committee. The last bit used shall gage at least 15/16 in.

Two prizes, a first, of $20,000 and a second, of $5,000, will be awarded according to the minimum figures obtained by dividing the total cost (composed of first cost of machines and rigging less valuation at end of competition, wages, air, water, drill sharpening, maintenance and stores) by the footage drilled. All machines with accessory parts must be delivered at Johannesburg, free of charge, on or before Jan. 31, 1909.

A MICROSCOPIC INVESTIGATION OF BROKEN STEEL RAILS: MANGANESE SULPHIDE AS A SOURCE OF DANGER.*

By HENRY FAY.†

During the past few years there has been much talk about the quality of steel rails. On looking over the literature of the subject the writer was not completely satisfied with the reasons advanced for the breakage of rails, and it was decided to make a collection of broken rails from various sources for the purpose of further study. The results herewith reported are only a small part of the work, dealing particularly with those rails in which considerable amounts of manganese sulphide were found. Incidentally, other material than rail steel in which manganese sulphide was found will be mentioned. The results reported have been obtained to a very large extent from personal work conducted at the Watertown Arsenal in collaboration with Mr. J. E. Howard. Mr. Wint, working for the degree of S. B. at the Massachusetts Institute of Technology

Fig. 1.

under the author's direction, has obtained some important results, which will later be published in full and from which some abstracts will be made. The two investigations have been going on simultaneously, and the results obtained in each have served to confirm the other in many ways.

The causes variously assigned to rail breakages may be classified under the following heads: (1) Improper chemical composition; (2) segregation; (3) improper heat treatment; (4) rolling flaws.

Under the first of these heads the most frequent sources of trouble are: carbon, which may be too high or too low, and about which personal opinion is liable to differ; phosphorous, which will produce brittleness when in excessive amounts; and sulphur, which, if present as iron sulphide, will make rolling difficult; and slag, which is an indefinite term, embracing oxides or silicates, or both. Sulphur, when present as manganese sulphide, has been declared to be harmless, but that it is an extremely brittle and perhaps dangerous material will be demonstrated. It must be stated at once that all manganese sulphide is not injurious; in fact, most of it is harmless. The conditions under which it becomes harmful will be shown.

Fig. 2

So much has been said of segregation, heat treatment and rolling flaws that they will only be referred to incidentally in discussing breakages in general.

In beginning the work the first piece examined was a small section broken out of the foot of a rail and in which there was a good-sized check. The fracture was fine-grained, but showed at one point a distinctly fibrous appearance. This is well shown in Fig. 1, in the upper left-hand corner. The metal was cut through just beyond the check and polished to a mirror surface. The surface began to pit badly on a line with the check. Microscopic examination before etching showed manganese sulphide where the pitting had taken place. Fig. 2 shows the manganese sulphide at the point of the check. Pitting of the surface on polishing, which can readily be seen with the eye, invariably reveals the presence of manganese sulphide. Slag may also cause pitting, but the appearance of the pits is usually quite different. Etching the sample with picric acid revealed a structure which was fine and all that could be desired, showing evidence of good heat treatment. Fig. 3 shows the appearance of the etched specimen. Evidently, then, the fibrous part of the fracture was due to the presence of manganese sulphide. This view seemed entirely probable, since the check and the sulphide area coincided in position exactly, and, further, it seemed highly probable that manganese sulphide might be a brittle substance. This latter assumption has since been confirmed and will be discussed in detail later.

Fig. 3

The next examinations were made upon a number of rails which had broken in the foot in the crescent form. The samples showed in every case all of the characteristics of the crescent break. Near the top surface of the fractured piece the metal in nearly every case showed a thin layer of apparently more brittle material, and in many cases fine checks, extending in the direction of rolling, similar to the one just described. Sections were cut out of these crescent breaks, polished, transversely and longitudinally, and examined. In each one, manganese sulphide was found in considerable quantities in the polished specimen. It was present in the form of long threads, extending in the direction of rolling, as shown in Fig. 4. The etched specimens showed a fine structure, as may be seen in Figs. 5-7. It will be noticed that the manganese sulphide is extended in the direction of rolling, and in some cases, as in Figs. 6-8, there are streaks of ferrite running parallel to the manganese sulphide. Whether or not these streaks originally held manganese sulphide in place is not definitely known. It is possible that the sulphide was torn out in polishing. Streaks of this character and also surface streaks deserve further study. There can be no doubt, however, of the intimate association of the streak and manganese sulphide. The essential point in the case is this: All rails which have broken out in the foot in the form of a crescent contain manganese sulphide alone or manganese sulphide and ferrite drawn out in the direction of rolling. With the structure fine in every case and very little lamellar perlite the cause for breakage cannot be placed on the heat treatment which the rail received. The large amount of manganese sulphide seems to be the cause of these fractures, and that this is true will be shown by further evidence which, I believe, will refute the statement made by Snow* that crescent breaks are due to gas seams and rolling flaws. The evidence obtained thus far pointed suspiciously toward manganese sulphide, and this suspicion was confirmed in the examination of a rail which showed a considerable number of streaks. In cutting out the head of the rail in steps, each step showed streaks on machining, and these were emphasized by etching. The top of the head of this rail was polished, and like the crescent breaks it showed considerable pitting running in the direction of the rolling. On etching with picric acid the streaks appeared bright and were of varying widths, running in parallel lines in the direction of rolling. Throughout each streak was found a considerable amount of manganese sulphide, associated in some cases with a small amount of silicate, and both lying in the ferrite areas. In Fig. 9 is seen one of the narrow streaks, with its manganese sulphide embedded in ferrite. A broad streak is seen in Fig. 10. That the light appearance of the streak is due to ferrite is shown by an examination of Figs. 10 and 11. The latter photograph was taken at a spot immediately adjacent to Fig. 10. On etching the ferrite areas remain bright, while the perlite is darkened. The distribution of perlite invariably takes place in this way. This distribution, together with a wide and a narrow streak with the embedded sulphide, are all well shown in Fig. 12. That rails in which streaks of this character were found were broken along these lines was known, but the mechanism of the break was not known. Having found these streaks with the associated manganese sulphide on both the top of the head and the bottom of the foot of the rail, it was considered desirable to know whether or not they penetrated through the rail from top to bottom. Transverse sections of the head and foot were then polished and etched, and showed that the penetration of the streak was only to a limited extent at the top and bottom. The considerable manganese sulphide was found throughout the cross section, but the ferrite streak was apparently a surface phenomenon, extending in only a very short distance. An examination of the transverse section of the foot at a point where the streak penetrated in showed manganese sulphide extending in from the surface toward the web. A photograph taken of these spots is shown in Fig. 13.

Fig. 4.

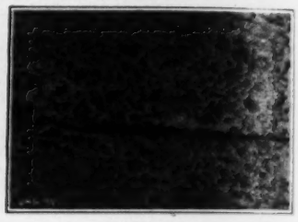


Fig. 5

Having conceived a suspicion of the brittleness of manganese sulphide, it was decided to test it by subjecting the rail to strain such as it might get in service. The foot was blocked on either side and pressure applied vertically downward. Examination of the middle edge of the foot at the point of greatest strain was made from time to time to see if any cracks had started. Fig. 14 shows the beginning of a crack which extends alongside of and through the manganese sulphide. It will thus be seen that the brittleness of the material itself has been demonstrated, and also that it is cemented only weakly to the steel in which it is embedded. On applying further pressure this crack widened, as shown in Fig. 15, and developed in similar areas, as shown in Fig. 16.

The whole edge was examined to see whether cracks had started at any other point, but absolutely none were found. The specimen was further subjected to strain, and it finally broke before it had taken any appreciable permanent set. The fracture did not take place at either of the points of which photographs are shown, but through a streak adjacent to these two. The metal of the fracture showed a check on the lower side of the foot similar to the one shown in Fig. 1, and extending throughout the fracture. The fractured surface was polished, and the long check was found full of manganese sulphide. This observation, then, not only confirms the suspicion of brittleness of manganese sulphide, but also confirms the relationship between checks and manganese sulphide.

The next logical step in the investigation was to extend this method of attack to other material. Accordingly, sections were cut out of some crescent breaks, polished, etched and examined for manganese sulphide. Instead of straining so that the crack might be developed along the length of a sulphide area, the force was applied in such a way that the strain would be across the direction of rolling of the rail. In this way numerous cracks were developed across the manganese sulphide areas, as is shown in Figs. 17 and 18. The fracture of the metal took place after it had taken a slight permanent set. Extreme brittleness was shown here, and greater brittleness possibly would have been shown if the force had been applied so that the cracks could have been developed along the direction of rolling. Fig. 19 shows the fracture of one of the pieces cut out of a crescent break. Its brittle nature is clearly indicated.

Further evidence was procured from a piece of metal cut out of a 12-in. rifle which had broken in service. This metal had shown streaks on machining, and an examination showed a large amount of manganese sulphide in the streaks. The structure was distinctly sorbitic and indicated excellent heat treatment, but, unfortunately, the metal was filled with manganese sulphide. The structure and the sulphide are shown in Fig. 20. An examination of the various sulphide areas was made before and after straining. It was found that cracks developed not only through, but around, the manganese sulphide. In Figs. 21 and 22 are shown the same area before and after straining, with the crack developed and running into a large

Fig. 6.

Fig. 7.

*Paper delivered before annual meeting of the American Society for Testing Materials, June 23-27, 1908, Atlantic City, N. J.

†Professor of Analytic Chemistry, Massachusetts Institute of Technology, Boston, Mass.

*Iron Age, V. 81, p. 684.

isla of sulphide. In the same specimen the cracks foll ed the outlines of some of the islands. In Fig. 23 is sh wn a piece of manganese sulphide which had been cra d around its outline where it had been cemented to metal, and which has been pushed by means of a dle at right angles to its original position. The

Fig. 8.

significance of the beginnings of cracks in metal of this character is evident now, but it will be made more evident later.

With the evidence thus developed I was prepared to find some connection between many fractures beside the crescent breaks and the presence of manganese sulphide and in this I have not been disappointed. In the beginning of this paper, rolling flaws were spoken of as one of the chief causes of fractures. Only two frac-

Fig. 9.

Fig. 10.

Fig. 11.

tures of this kind have been examined and from the evidence presented by these cases it would be unfair to draw any definite conclusions, but it is significant that the crack developed in each case followed a streak in which manganese sulphide was embedded. In one case metal examined was cut out of the foot of a rail which had broken in service. The top of the foot was crimped in the process of rolling and the fracture took place at this point. A cross-section at the crimped portion showed a crack fairly wide at the surface and narrowing as it proceeded inward. There was considerable flow of metal at the beginning of the crack, but diminishing as it proceeded. Following the crack inward, manganese sulphide was found on the walls of the narrowest end and extending beyond the point where the crack stopped was a streak in which manganese sulphide was embedded. This is well shown in Figs. 24-26, which show the beginning and middle portion of the crack and the streak along which it would have followed. That this crack began in a manganese sulphide area seems highly probable. In the same specimens where the metal was crimped in rolling there was found a large mass of sulphide which extended in a short distance from the surface of the rail, and then extended further in two narrow streaks. With such brittle material it can easily be conceived as the starting-point for a crack, and the crack once formed would extend along the two narrow branches. This area is shown in Fig. 27.

Fig. 12.

In another rail there was a minute crack following a streak in the extreme edge of the foot. Microscopic examination showed manganese sulphide on the walls of the crack and disseminated throughout the ferrite which lay only on one side of it. On the other side was the normal ferrite and perlite areas. Comparison of this photograph, Fig. 28, with Fig. 12, will show a decided similarity, except for the crack. In each case manganese sulphide is found with an excess of ferrite on one side and the normal structure on the other.

When manganese sulphide is found in combination with a hardened surface the result is decidedly bad, for then cracks are likely to develop not only through the sulphide, but also through the hard metal on the surface. Such a combination has come under the author's attention. The walls of the cracks were lined with manganese sulphide, and the cracks extended from the hard surface down into the softer metal of the head. Etching with picric acid had little or no effect upon the hard surface, while Kourbatoff's reagent darkened it in a very few minutes. In this piece of metal the hardened surface was filled with cracks, and along each crack manganese sulphide was found on the walls. In speaking of Figs. 21, 22 and 23, it was stated then that the significance of the beginnings of cracks in manganese sulphide was evident, but that it would be more evident later. It will be well to point out the fact here that the rifled surface of our large guns are hardened by the high temperature produced by firing. In that case, if manganese sulphide be present in considerable amounts, it is not at all surprising that the gun has a very short life, for with such brittle material as hard steel and manganese sulphide cracks will inevitably begin and extend until fracture results. The conditions in a rifle, then, if the sulphur be high, are almost identical to this particular case.

Fig. 13.

Fig. 14.

Fig. 15.

Another interesting application of the same idea is to be found in a rail head which showed a distinct center of radiation of the fracture, as shown in Fig. 29. Mr. Howard called my attention to this and suggested that there might be some connection between the beginning of the fracture and some brittle material. On polishing a cross-section of the head distinct pitting took place at a point corresponding to the center of radiation. This pitted spot was found to be filled with manganese sulphide, and the unetched surface is shown in Fig. 30. Etching with picric acid showed segregation and also marked the same spot as is shown in Fig. 31. In two cases only has the center of radiation of a fracture been connected with the presence of manganese sulphide, but it will undoubtedly be found in other cases, and the study of this phenomenon will lead to interesting results.

PREVIOUS INVESTIGATIONS.

As there has been expressed to me at times some doubt as to the identity of manganese sulphide, it seems to be well to review briefly the literature on the subject before discussing the effect upon the steel industry of the foregoing results.

By purely chemical means Osmond and Werth,[1] in 1885, discovered that sulphur in steels which contain manganese exists in the form of manganese sulphide. In 1888 Osmond[2] described experiments which showed that steels which are partially dissolved in hydrochloric acid have less sulphur and manganese in the part dissolved than the part which has gone into solution. Stead,[3] independently, confirmed this same observation. As a microscopic constituent it was identified by Prof. Arnold as a dove-gray substance, and this was confirmed by Andrews in his various studies of steel rails. Le Chatelier and Ziegler,[4] using the Goldschmidt process, prepared and studied steels containing manganese and sulphur and confirmed the statements of Arnold, Arnold and Waterhouse[5] and Stead; Law[6] has subsequently confirmed this.

To make certain that manganese sulphide appears as described by Arnold and others, the author had some pure manganese sulphide prepared by precipitation, using the method of Olsen[7] for its preparation. This was melted in an electrically heated vacuum furnace with some pure iron. The two substances were mixed so as to have about 0.08% sulphur in the resulting 100 gram button. This button was cut through from top to bottom, polished and examined, and it showed the characteristic dove-gray spots of manganese sulphide. It is proposed to roll this material at various temperatures to see if the sulphide can be elongated. The identity of the dove-gray particles can no longer be doubted, since nothing but pure iron and manganese sulphide were used in the experiment.

That iron sulphide is harmful there can be no doubt, but that manganese sulphide is harmless there is much doubt. Le Chatelier and Ziegler state:

> The manganese will absorb all the sulphur, and in this way remove the bulk of it from the metal. It is indeed what has been observed in practice. The other part of the sulphide which remains imprisoned in the metal during its solidification is disseminated in the condition of small grains, whose influence cannot be more harmful than that of small bubbles similarly distributed.

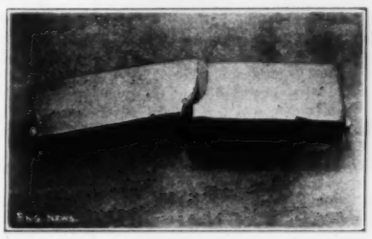


Fig. 19.

Arnold and Waterhouse, in a microscopic study of some of Brinell and Wahlberg's steels have shown the harmful influence of iron sulphide, and further have shown that some steels with 0.55% sulphur in the form of manganese sulphide have forged perfectly.

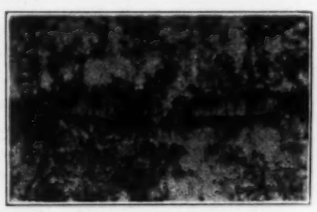


Fig. 17.

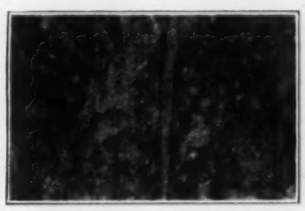


Fig. 18.

Stead casts suspicion on both manganese silicate and sulphide, and suggests that their influence be further studied.

The form in which manganese sulphide exists determines whether or not it is harmful. Arnold points out that the appearance depends upon which way the section of metal be cut, i. e., whether it be cut transversely to the direction of rolling, parallel horizontally, or parallel vertically. By an examination of this kind we can get an idea of the shape and dimensions of the sulphide areas. In the crescent breaks which are cut parallel to the direction of rolling there is found usually an elongated ellipsoid, such as that shown in Figs. 4 or 5. The transverse section of this same material will show round dots, as in Fig. 2. Such elongated masses are, I believe, distinctly harmful.

Fig. 16.

Fig. 20.

Fig. 21.

Similar forms are found in the steels which show streaks, although here there is a tendency toward a shortening and a flattening of the ellipsoid, as in Figs. 12, 20 and 21.

In other cases the sulphide may be caught near the surface, as shown in the figures showing rolling flaws, or in large masses, such as shown in Fig. 32, which is a so-called "wrought-iron" rivet, which was one of a lot which gave bad results in service.

[1] Theorie Cellulaire des proprietes de l'Acier. Ann des Mines (8), 1885.
[2] Ann. des Mines (8), 1888.
[3] The Iron & Steel Mag., 9, 105.
[4] Bull. Societe d'Encouragement, Sept., 1902.
[5] Journal Iron & Steel Inst., 1903.
[6] Journal Iron & Steel Inst., 1907, 94.
[7] Journal Amer. Soc., 26, 1625.

In one case the author has seen a piece cut out of an axle broken in service, about one-half of an inch square. All of these forms are believed to be exceedingly harmful.

On the other hand, if the section cut in three directions shows an appearance such as shown in Fig. 33, there can be no appreciable danger from it, except that the ductility of the metal is lower than it ought to be.

The form in which the sulphide is finally found depends very largely upon the treatment which the metal

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25.

Fig. 26.

Fig. 27.

has received. If the metal has merely been forged it will then appear in small spherical masses. If, on the other hand, rolling has been begun at a high temperature the sulphide areas will be elongated as in the crescent breaks.

In his work on sulphide of iron, Le Chatelier makes the statement that, inasmuch as sulphide of manganese often appears crystallized, it has a higher freezing-point than any of the other constituents present. This statement has been granted by Arnold and Waterhouse[1], but has been questioned by Law.

It seemed highly desirable to determine the melting-point of manganese sulphide in order to establish the conditions under which it might be elongated as found in the crescent breaks. For this purpose pure green manganese sulphide was prepared and dried in such a way as to prevent oxidation. It was then melted in an electrically heated furnace while a current of dry hydrogen sulphide was passed in to prevent oxidation. A thermo-couple, consisting of a platinum, platinum-iridium junction was inserted into the liquid mass and readings of the galvanometer were taken at intervals during the cooling. The freezing-point was fairly sharp at 1,162° C. This was checked by a melting-point on the same sample. Below the melting-point the mass was decidedly plastic through a considerable temperature interval. This melting temperature will be influenced to some degree by the amount of manganese in the steel. Manganese sulphide is probably capable of dissolving a certain amount of manganese, and this would lower the freezing-point to some extent. It would require a study of the equilibrium between manganese and manganese sulphide to definitely decide this. Inasmuch as the color of the sulphide varies with the amount of manganese present, the above assumption seems to be warranted. The specific gravity of this sample was 3.966.

Fig. 28.

Fig. 30.

Fig. 33.

This experiment definitely refutes Le Chatelier's statement quoted above, and further explains the elongated masses of the sulphide. Rail steel solidifies at about 1,450° C. If rolling begins at any temperature above 1,162° the manganese sulphide will still be liquid from the temperature at which rolling began to 1,162° C., and below this temperature being, in a plastic condition, it is elongated in the direction of rolling. Where rolling pressure is exerted on three sides it would appear in elongated threads. If, however, rolling pressure is exerted on only two sides it might be expected to be found in flattened elongated masses. This latter conclusion has not been verified, but examination of sections of flat bars will soon be made. Steels which are high in sulphur should not for this reason be rolled at too high a temperature, for if much manganese sulphide has been entrapped it will surely be rolled out into a form which will ultimately lead to trouble.

That manganese sulphide, when existing in certain forms, is a harmful constituent of steels can no longer be doubted. The remedy seems to be very simple, and on this account there should be no anxiety.

Specifications should be so drawn as to limit the amount of sulphur in the steel. At the present time some of the specifications do not even mention sulphur. Having done this, the next step is to allow the metal to stand a longer time after the addition of the ferro-manganese. With the specific gravity of manganese sulphide 3.966 and steel 6.82, it should rise to the surface and be skimmed off with the slag if given sufficient time. Usually this time interval between charging of the ferro-manganese and the pouring of the ingot is very short. The desire of the manufacturer to increase his output has led him to cut down this interval to the shortest possible limit, with the natural consequence of a large number of broken rails. A longer time interval will allow the metal to purify itself.

If, on the other hand, it is not permissible to start with a low sulphur ore, or to allow a sufficient time interval for the removal of the manganese sulphide, resort must be had to electric refining of the molten metal by means of a basic slag.

In conclusion, I wish to express my indebtedness to Dr. P. H. Dudley, Dr. C. B. Dudley and Mr. J. W. Snow for samples of broken rails; to Mr. Wint for devoted service, and to Mr. G. R. Norton for his skillful photographic help.

[1]The Metallurgist, 6, 310.

GRADE-CROSSING REMOVAL ON THE PHILADELPHIA & READING R. R. IN THE CITY OF PHILADELPHIA.

Work is in progress on extensive track elevation in the city of Philadelphia for the Philadelphia & Reading R. R., involving a total expenditure of about ten million dollars. The lines affected are the Philadelphia, Germantown & Norristown R. R., extending from Broad St. to the crossing of the Richmond Branch near Wayne Junction, a distance of 3.7 miles, and the section of the Richmond Branch between Somerset St. and Richmond st., 1.3 miles. There will be 32 grade crossings abolished, and the sections to be elevated include several large yards which add much to the cost of the work.

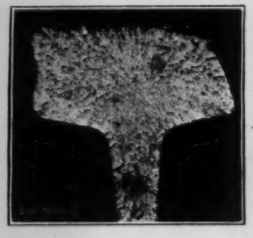


Fig. 29.

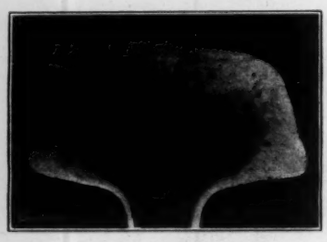


Fig. 31.

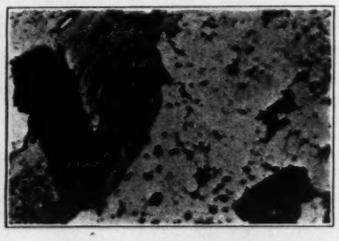


Fig. 32.

From information furnished us by Mr. W. Hunter, Chief Engineer of the Philadelphia & Reading Ry. Co., we take the following information:

The work in question was made possible by an ordinance enacted October 13, 1906, authorizing the Mayor to enter into a contract with the Philadelphia & Reading Ry. Co. to e certain portions of the lines of railroads ated by it within the city of Philadelphia.

The work naturally divides itself into sections;

1st. The Philadelphia, Germantown & N town R. R., between Green St. and Bro From Green St. to Brown St. the tracks, in number, are carried upon a solid fill walls of masonry and steel bridges with steel floors, waterproofed, over the st From Brown St. to Jefferon St. the four t are carried on a steel viaduct resting three lines of columns, two on the curb lines one in the center of the street. The via consists of eight lines of longitudinal girders, with space generally 50 ft. in length, supported upon transverse girders carrying a solid steel waterproofed floor. Between Jefferson St. and Broad St. the tracks, which are five in number north from Columbia Ave., are generally carried by solid fill with masonry walls and steel bridges with steel waterproofed floors over the streets, concrete arches will be erected at Berks, and Norris streets. At Broad St. the grade is unchanged.

2d. On the line of the Philadelphia, Germantown & Norristown R. R. from a point north of Broad St. to the crossing of the Richmond Branch just south of Wayne Junction. The entire extent of this work is carried upon a solid fill, with masonry walls between the streets and with steel bridges with solid waterproofed floors over same. There are four tracks in this section.

3d. On the Richmond Branch the tracks are to be elevated between the bridge at Somerset St. and Richmond St. The railroad at this point has a large yard and is raised from 5 to 6 ft. Kensington and Frankford aves. are to be depressed and carried beneath the tracks. Aramingo Ave. is to be opened in place of Cedar St., and Belgrade and Thompson sts., neither of which were formerly opened over the railroad, are to be opened and carried beneath it. The changes in grade of the streets are very considerable.

SEWERS.—On account of the depression of some of the streets below the general drainage level, a considerable amount of revision of sewers has been made necessary, and nearly all of this work is under contract and well advanced. The total cost of the sewer changes now under contract will approximate $335,000. Work was started on most of the contracts in September, 1907.

At the present time the work of elevating the tracks is under way between Columbia Ave. and Broad St. At Berks St. a temporary grade will be constructed to connect the present level with the new elevation. Fig. 1 shows how the work is being carried on. The railway travel which is very heavy, amounting to 467 train movements per day of 24 hours, is all carried on two temporary tracks on the west side of the line within the limits above given; and the eastern wall, a temporary trestle to carry two tracks, a crib and half of the bridges over the streets, are being built. Upon this being completed, travel will be placed on the new high level, and the western wall and the western portion of the bridges finished and the fill completed. At the present time the eastern retaining wall and the eastern portion of the bridge abutments with the temporary trestle is well under way.

...mporary freight yard has been constructed on ...roperty of the railway company at 19th a... ...ndiana Sts. for the purpose of taking ca... ...f the business which will be thrown out by ... reconstruction of the yards to the new le... and providing means for the industrial es... ...ishments that will be temporarily deprived of ...nection with means of receiving and ship- p... ...freight.

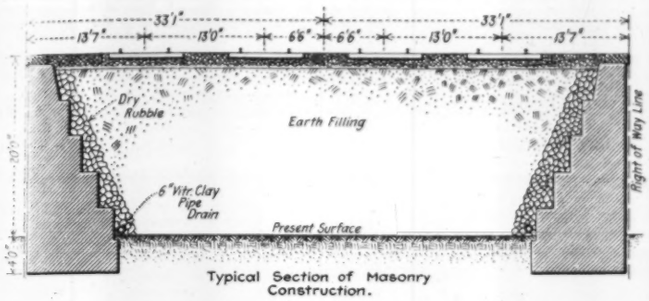
Wayne Junction, a temporary yard for s... ...ge and care of engines has been constructed w... coal dock, engine shelter, water tanks and a... pit to take the place of the engine yard a... ...reen St. during construction.

...e yards between York and Cumberland Sts., f...erly used for car-cleaning purposes, are being reconstructed at a new elevation for freight use, and all the car cleaning transferred to the yard between Cumberland St. and Lehigh Ave. Two other freight yards are to be elevated, with driveway ramps leading to them. These are located at 10th and Berks Sts., and 9th and Master Sts. The present engine yard at 9th and Green Sts. is to be entirely reconstructed, and the coaling station arrangements entirely changed.

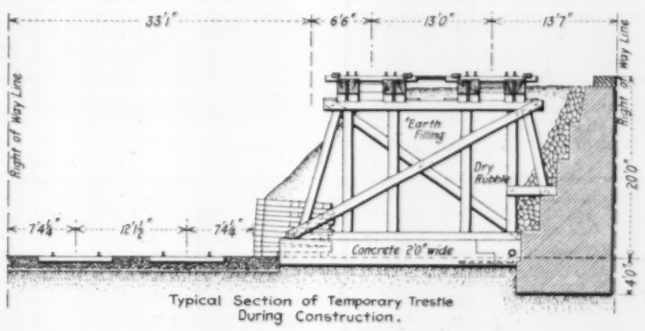
DIVISION OF COST AND CONSTRUCTION.—Under the terms of the ordinance, the cost of the work, including all damages for change of grades of streets, etc., is to be evenly divided between the city and the railway company, except that the railway company is to pay the entire cost of two tracks between Green St. and Girard Ave., where four tracks are planned and but two tracks exist at the present time. The railway company is also to pay for any increased facilities which may be required.

Generally speaking, the work of construction is divided; the city making contracts for all changes of grade in streets, moving and rebuilding municipal structures, etc., and the railway company raising its tracks, constructing the bridges and doing all the necessary work of a railroad character. All contract plans are approved by both parties.

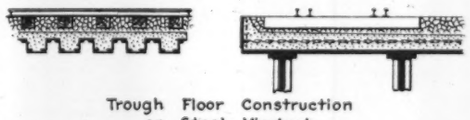
PERSONNEL.—Under the ordinance, the Director of the Department of Public Works represents the city and the Chief Engineer of the railway company represents the railway company. Mr. George R. Stearns is the Director of the Department of Public Works and Mr. William Hunter, M. Am. Soc. C. E., the Chief Engineer of the railway company. All general plans are also signed by Mr. Theodore Voorhees, M. Am. Soc. C. E., First Vice-President of the railway company, and Mr. George S. Webster, M. Am. Soc. C. E., Chief Engineer, Bureau of Surveys, who has charge of the work for the city of Philadelphia. Mr. Samuel Tobias Wagner, M. Am. Soc. C. E., represents the railway company in the field; Mr. James W. Phillips represents the city in a similar capacity.

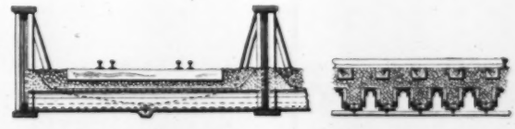


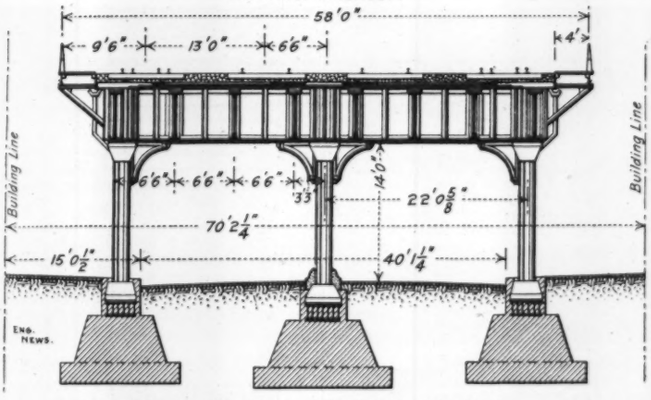
Typical Section of Masonry Construction.



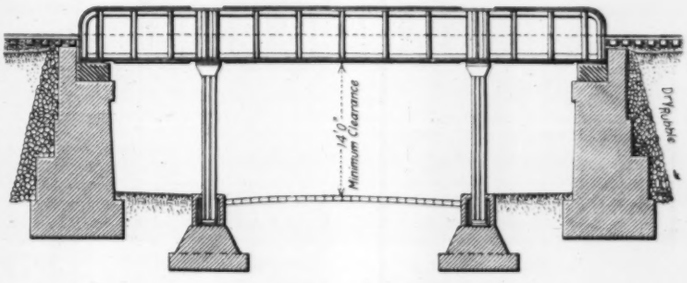
Typical Section of Temporary Trestle During Construction.


Trough Floor Construction on Steel Viaduct.


Sections of Floor.



Typical Section of Steel Viaduct.

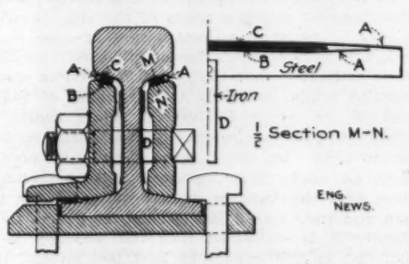


Typical Bridge Construction.

TYPICAL CONSTRUCTION DETAILS ON TRACK ELEVATION WORK OF PHILADELPHIA & READING R. R. IN PHILADELPHIA.

PACKING STRIPS FOR WORN RAIL JOINTS.

One of the numerous difficulties attendant upon the maintenance of rail joints in good condition is the wear of the contact surfaces of the rail head and splice bars. The use of packing strips of metal, or of such elastic material as tarred felt, has been tried to a limited extent, but without much success in preventing the wear. A method sometimes practiced on foreign railways is to put in a bolt washer or a thin strip of iron as a filler when the bars have become badly worn or distorted.



Packing Strips for Worn Rail Joints.

In the "Bulletin" of the International Railway Congress for April, 1908, is a paper by Mr. Leon Edelstein (taken from the "Zeitschrift des Oesterreichischen Ingenieur und Architeckten Vereines") describing his new type of steel packing piece for this purpose. This is shown in the accompanying cut. The packing piece, A, is a strip of steel 0.04-in. thick, with one side bent to fit under the rail head, and this side is doubled in order to form a channel for the adjustable steel filler strips, B and C. These are of unequal length, and are both shorter than the channel in which they lie. They are tapered at the ends. The doubled portion of the strip A is longer than the straight fillers B and C, but does not extend the full length of the strip. In this way the combined thickness is greatest at the middle (where the wear is always greater), and tapers off towards the ends of the splice bars. The strip A is the full length of the bars and has riveted to the middle a leg D, which holds it in place when the joint is being assembled. The fillers B and C may vary from 0.04-in. to 0.08-in. in thickness, and can be used in such number as to adjust the packing to fit the condition of a worn joint. The total thickness required is usually 0.12 to 0.16-in.

The device is said to have an important effect in improving the condition of the track and in increasing the life of the rails and splice bars. When applied to a worn joint it fills the space caused by wear of the contact surfaces near the ends of the rails, and so makes an easy-riding track, when otherwise it would be necessary to put on new bars or even to lay new rails. The pounding and wear due to low joints is also avoided. Service trials are said to have given very satisfactory results.

A PROPOSED LAND RECLAMATION AND DOCK SCHEME FOR NEWARK, N. J.

Extensive schemes of municipal dock and harbor construction are common enough abroad but have been rarely entered upon in this country. The city of Newark N. J., has had under consideration for some time past a combination of municipal docks, or what might be termed a canal harbor, and the reclamation of a portion of the large area of meadow lands within the city limits.

More than 4,000 acres of undeveloped meadow land now lie within the city limits of Newark, and in the past have given rise to great nuisance through the mosquito breeding which their stagnant waters at times afford. Recently this land has been ditched, with reported good results so far as mosquito extermination is concerned, but still lies idle.

The city has recently secured legislative authority to expend $1,000,000 in the reclamation of this land and the construction of improved shipping facilities. In our issue of Dec. 5, 1907 (p. 618), we published a note outlining plans for docks and for filling a portion of the land, the plans having then recently been submitted by Mr. James Owen, M. Am. Soc. C. E., to Mr. Morris Sherred, M. Am. Soc. C. E., Chief Engineer of the Board of Water Commissioners. In February, 1908, the Board just named appointed an Advisory Dock and Meadow Reclamation Commission, which, besides Messrs. Owen and Sherrerd, included Mr. Henry Dickson as President, and Messrs. Isaac F. Roe, E. P. Goodrich and George T. Hand. Mr. Joseph G. Wolber serves as Secretary of the Commission.

Under date of June 25, 1908, the Commission submitted a report to the Board in which it discussed the general problem, reviewed at some length the probable manufacturing development and shipping needs of the city and submitted recommendations for reclaiming, eventually, 1,150 acres of meadow land, together with a more limited scheme for immediate execution.

In opening its report, the Commission states that in the ordinary course of events the improvement of the meadows would be effected by the usual process of opening and grading the streets and filling in the adjacent lots to the proper level. It estimates that filling the lands by usual methods would cost 50 cts. per cu. yd., whereas if they are filled by hydraulic dredging, utilizing the earth removed from the canal which would form an important part of the proposed dock scheme, the cost of filling would be only 16 cts. per cu. yd. For the area involved, the saving in favor of reclamation by canal construction would be nearly $4,000,000.

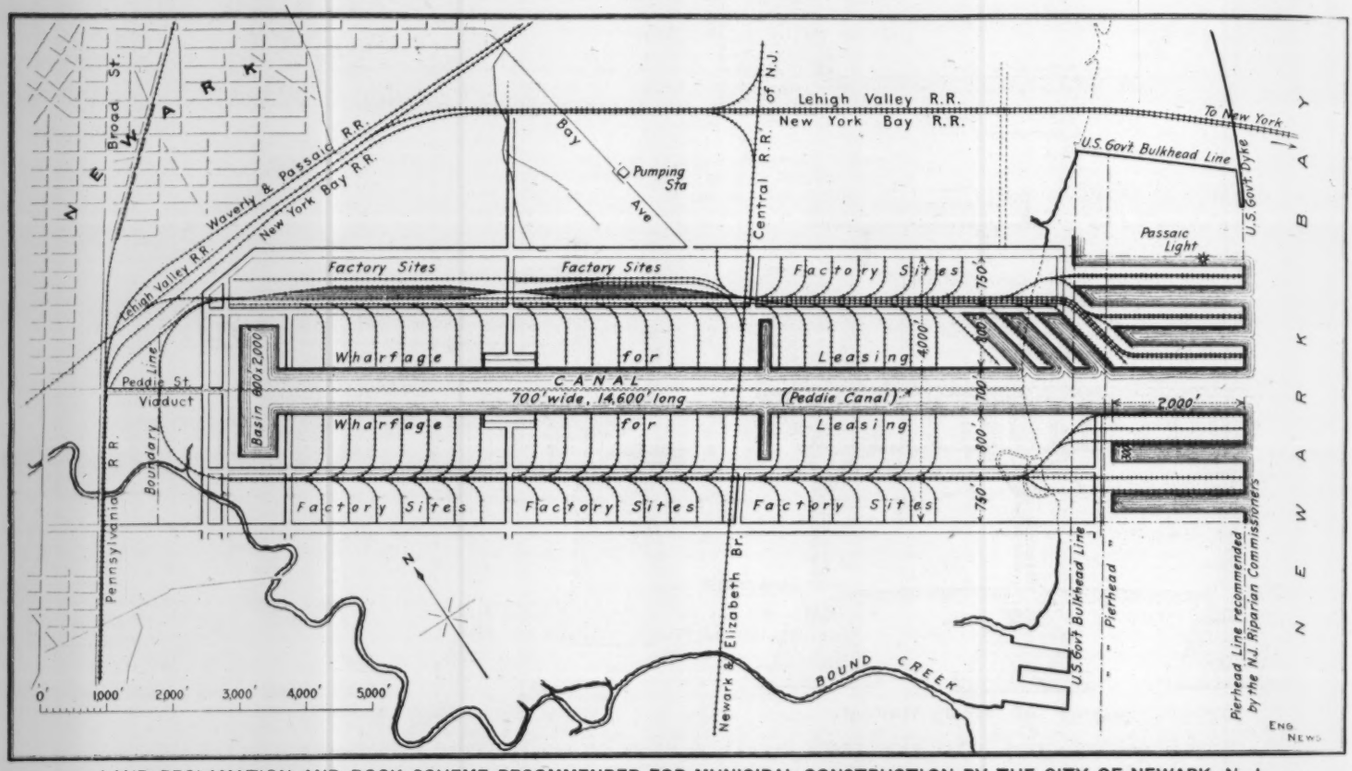
The Commission assumes that one acre of canal excavation would fill and reclaim approximately four acres of meadow land. It recommends that territory be acquired by the city, as indicated by the accompanying plan, and that the acquired area be added to by extending the existing pier-head line as shown. This new pier-head line has already been recommended by the New Jersey Riparian Commission. It follows approximately the 6-ft. (water depth) contour. The Riparian Commission has secured deeds of the land which would be required by the new pier line, but before the line can be actually effective the approval of the United States Government must be obtained. The Commission notes that if the present pier line is maintained, and at the same time a project for a 30-ft. water depth in the bay is executed, some 40,000,000 cu. yds. of material would have to be dredged, which at 16 cts. per cu. yd. would cost $6,400,000 —and all to no valuable end, as compared with filling.

In its review of the future manufacturing industries and shipping needs of the city, the Advisory Commission estimates that by 1950 Newark will have a population of 1,500,000. By 1950 it is estimated that the Newark factories would require crude materials to the value of $414,000,000, of which $80,000,000 worth would be imported. Exports at that time are estimated at $94,000,000. In using these figures to predict dockage needs, it is assumed by the Commission that the imports have a value of $40 per ton and the exports $60 per ton, and from these figures it is estimated that the tonnage to be handled in 1950 would be 2,000,000 tons of imports and 1,570 tons of export. It is further assumed that wharfage room at the rate of 150 tons per lin. ft. per annum would be required, thus making necessary by 1950 about 24,000 lin. ft. of piers and bulkheads to accommodate the estimated foreign tonnage for the port of ark. There is to be considered, in addit this, tonnage for coastwise, canal and traffic, but specific figures of this traffic a given in the report.

The area required for manufacturing pu in Newark in 1950 is roughly estimated b Commission at from 45,000,000 to 90,000,0 ft., the latter being about one-half the ful of meadows now idle.

Coming now to the proposed canal and scheme, the report from this point on m quoted substantially in full:

> The area of the territory proposed to be acqui 12,500 ft. long by 4,000 ft. wide, or 1,150 acres which will make possible a reclamation of 40, sq. ft. of land, exclusive of water surface. The ri rights should be acquired for the full 4,000 ft. fr on the Bay. [See accompanying map for the g scheme.—Ed.]
>
> First is the canal 700 ft. wide designed for an u depth of 30 ft. at low water. In addition to the itself piers and slips are suggested for the bay fr north of the canal and two piers and three slips on the north side of the canal to the west of those front on the bay. This layout, it is thought, will cover all the probable ocean and coastwise trade that can be induced to come to Newark in a reasonable period. A somewhat similar layout is suggested for the south side of the canal, but its necessity is somewhat far in the future.
>
> To the west of the piers and slips, extending to the westerly end of the canal, it is proposed to erect a plain substantial bulkhead of permanent construction. This can be used for any purpose, either for manufactures or transportation, as the necessities of the future may disclose. At the extreme end of the canal, a basin is proposed, 2,000 × 600 ft., to facilitate navigation and to be used as a public dock. Two other public docks are also suggested on each side of the canal. Such docks will be of great material advantage, especially the one at the westerly end of the canal, as it will practically be in the heart of the city.
>
> The dock frontage as here outlined, will, it is conceived, supply all the water transportation wants of the territory affected and further elaboration in the line of piers and slips is not of immediate necessity. With the water transportation facilities defined, the land transportation must be designed in accord. The land transportation can be classed under three heads, namely, railroads, highways and trolleys. There are three main railroads that are contiguous to the territory suggested, and access to and from them can be easily attained.
>
> These railroads are the Pennsylvania, Lehigh Valley and Central Railroad of New Jersey. The plans show



LAND RECLAMATION AND DOCK SCHEME RECOMMENDED FOR MUNICIPAL CONSTRUCTION BY THE CITY OF NEWARK, N. J.
(Only a portion of this improvement is proposed for immediate construction.)

complete connections with these three roads, with a layout of storage yards and incidental switches for local service in different sections. Such a layout is, of course, tentative and is dependent entirely on the future development and requirements. It is designed, however, with the idea of eliminating as much as possible grade crossings, both between the highways and railroads and between the railroads themselves. One railroad crosses the territory proposed to be taken, viz., New Jersey Central. It is now a surface road. For proper protection of the land transportation and for facilitating water carriage it is necessary that the tracks of this road be raised to allow surface travel to pass beneath, and also to obviate the constant opening of the draw. The Lehigh Valley Railroad being on the north side of the Pennsylvania, a direct connection is shown crossing the Pennsylvania overhead, west of the bridge over the main line of the Pennsylvania. The Pennsylvania being on the surface easy connection with that road can be made. Highway communication is to be arranged for by having six main entrances: One on Peddie St. at the extreme west end of the canal with an overhead bridge over the main line of the Pennsylvania Railroad; one at Ave. D; one at Ave. H, to connect with South St.; one at Bay Ave.; one at Ave. R; and a sixth to be an extension of the proposed street on the southerly side of the layout up to Frelinghuysen Ave.

For local use there will be two main highways, parallel with the canal on each side, one 800 ft. from the canal, 100 ft. wide, and the other 1,650 ft. from the canal, 150 ft. wide, being the main thoroughfare. The latter is to be the boundary of the acquired tract and it is recommended that the cost of opening and grading this thoroughfare be assessed on the property benefited. These highways will give longitudinal connections, and cross streets are designed running north and south. The exact location of all the latter is hard to determine, but certainly they should run to the public docks as outlined.

A complete trolley service should be arranged for; tracks could be laid on any or all highways as built, and should be used for both passenger and freight service, under proper regulations and restrictions. A limited zone, including this district, might be established by the city for the use of the trolley tracks by ordinary freight cars with electric haulage. This would enable the manufacturers of the city to compete on equal terms with others who are located where such facilities are obtainable. The construction of docks and manufacturing plants would, however, bring a large passenger travel requiring trolley tracks in any case. The main principles of the project thus being outlined, detailed suggestions of development are now in order, but to that end it will be necessary first to consider the financial status of the case and what means are available. Three primary factors enter here to properly arrange a program: (1) A canal to improve the land; (2) docks to produce a revenue; (3) $1,000,000 of allowable expenditure. The first two must of necessity be of variable quantities in their relation to the third, but it will probably be wiser to keep the dock and canal quantities constant to themselves. If the million dollars is used the following items are constant and must be used to arrive at a definite amount of docks and canal to construct.

Land	$300,000
Dredging approximately from bay channel to shore line	152,000
Temporary bridge over Central Railroad	16,000
Digging open ditch outlet for low level sewer	6,000
Improving Bay Avenue	35,000
Engineering and contingencies	70,000
Total	$579,000

This leaves the sum of $421,000 for use in the construction of canal and bulkhead, and the proposed disposition of this money is now a matter of consideration, subject, however, to its enlargement by the assumption by the United States Government of the cost of dredging the Bay channel. This work properly belongs to the Federal Government, but in view of contingencies that might arise it is deemed safer to assume the cost as a city affair in order to insure immediate use of the city canal proper.

Taking the balance of $421,000 as above stated it is recommended to excavate by hydraulic pumps one-half of the width of the canal, namely, 350 ft., 22 ft. deep at low water, and fill the abutting front to the north to the extreme 2,000 ft. limit of the right-of-way. On the north side of this excavated canal, recommendation is made for the erection of a bulkhead or dock wall. This is a permanent structure of acceptable design and is in the end the cheapest. Estimating the excavation for channel 350 ft. wide and 22 ft. deep at 16 cts. per cu. yd. or $99 per lin. ft., and the construction of the bulkhead at $65 per lin. ft., makes a total cost of canal and bulkhead of $125 per lin. ft. Dividing $421,000 by $125 will give approximately 3,400 lin. ft. of canal and dock construction that can be completed within the appropriation. If, however, the outer channel is dredged by the Government leaving that amount for use by the city and the cost of this channel be added to the amount available the construction of canal and docks would then amount to about 4,000 lin. ft.

It is predicted that this amount of available frontage will be absorbed in the market in a few years, and by that time a good revenue will accrue to the city and the enterprise can be further extended.

The specific recommendation is:

To excavate a channel 16 ft. deep at low water and 350 ft. wide from the bay to the shore line.

To excavate the canal 350 ft. wide, 22 ft. deep and 3,400 or 4,000 ft. long, dredged material to be used for filling.

To build bulkhead for 30 ft. of water 3,400 or 4,000 ft. long.

To extend Bay Ave. from present terminus at pumping station to the canal, with temporary trestle crossing over the New Jersey Central Railroad, including grading and paving 20 ft. wide; and

To construct an open ditch for the discharge of sewage from the pumping station to the bay.

The commission is advised of the hearty cooperation of the railroad companies, now crossing the Newark meadows, namely, Pennsylvania, Lehigh Valley and Central Railroad of New Jersey, and a suggestion is made that for a more perfect arrangement of freight transfer between cars and vessels, a terminal operating company be formed composed of all the railroads running into the port of New York.

By such a method a great saving can be made in the handling of all the freight destined to and from Newark, but with the peculiar facilities that exist in this particular locality, i. e., vacant land, water and railroads all conjoined, facilities that exist nowhere else in New York harbor, it is not presumptuous to suggest that the future development of this locality may be due as much to a general port business as to the more particular wants of what is now Newark.

THE WATER RESOURCES OF THE OHIO VALLEY will be the subject of continued investigations by the U. S. Geological Survey in 1908-9, and will include special researches. A special district has been formed, with picked men, and with headquarters at Newport, Ky. The work is further outlined in a press bulletin issued by the Survey, as follows:

For a long time it has been evident that more minute studies of stream flow should be made in the tributaries of the Ohio, that run off the Appalachian Mountains. With the funds at the command of the Survey it is not possible to undertake all of this work at the present time, but a beginning has been made by selecting the Kanawha drainage basin for special study, and during the next year, if the appropriations to be made by Congress will permit, the work will be extended to adjacent basins, such as the Monongahela, Kentucky, Green, and Cumberland.

The Ohio Valley is commercially the most important of all the interior river countries, and as this valley has been visited by extremely destructive floods, the work of the Survey will be of great value. It is also becoming evident that the enormous amount of water power available in this area has not been generally realized, and a part of the Survey's work will be to determine more accurately the extent of this power and the points at which it may be advantageously utilized.

THE NATAL GOVERNMENT RAILWAYS had a total mileage of 1,065 miles at the end of 1907, according to the annual report of the General Manager. The main lines are of 3½ ft. gage, but secondary lines of 2½ and 2-ft. gage have been built. One of the most important lines now under construction runs south to connect with an east coast extension of the Cape Government Railways. The only existing communication is an indirect route through Central South Africa. The old 45-lb. rails are gradually being replaced with 78-lb. and 60-lb. rails on the open line and second-hand 78-lb. rails in station yards. At the up-country water stations the water is heavily charged with sediment in the rainy seasons, and treatment of the water would tend to reduce boiler repairs and increase the engine mileage between periods of washing out the boilers. A Kennicott water-softening plant has been installed at the Sundays River station for experimental work in this direction.

Grade reductions are being made at several points in order to permit of increased train loads. Some of these grades were reduced from 3% to 2%, and the loads increased from 325 tons to 390 tons. At other points the reductions have been made to enable train loads of 580 tons to be handled. In order to reduce expenses, the section lengths have been increased. An experiment has been made with maintenance by a floating gang of 47 men on a stretch of 78 miles. This system was introduced with success in the United States on the Ohio River Ry. a few years ago by Mr. C. E. Bryan. Imported creosoted pine ties are preferred to creosoted hardwood ties, and the experiments with ties made from colonial timbers have proved entire failures.

There are 336 locomotives, only 57 of which have tenders. The types are various, ranging from 2:6:0 and 4:6:0 to 4:8:0 and 4:8:2. The number of passengers carried was 3,035,100, and the freight traffic amounted to 2,577,879 tons. The train miles numbered 4,855,764. The receipts per train mile were $1.82, and the expenditures per train mile were $1.26. The operating expenses represented 70% of the gross revenue. Mr. Edward R. Ross is General Manager; Mr. John W. Shores, Engineer-in-Chief, and Mr. D. A. Hendrie, Locomotive Superintendent.

THE EFFECT OF ALKALI SOILS ON CONCRETE.

Within the past year the attention of engineers in those regions of the West where the so-called alkali soil is found have noticed a marked disintegration in many structures of concrete and of brick with cement mortar, which have been exposed to the action of water filtering through the alkali soil. In Great Falls, Mont., particularly, the City Engineer, Mr. C. W. Swearingen, was so impressed with the condition of the concrete in certain sewers in the city that he called in to investigate the matter the authorities at the Montana State Agricultural College. These experts started an investigation, the first report* of which has just been published, which assigns as the cause of the disintegration, the harmful effect of the alkali soil on a cement concrete. While the report is practically only a preliminary statement, the widespread use of concrete in the alkali regions of the West, makes this deduction regarding the probable effect of alkali soil on concrete a matter of considerable concern.

The two sewers which were investigated are described as follows:

The Third St. main sewer was constructed in the year 1890, the material used being Portland cement pipe of home manufacture, made in molds and put in place after the cement had hardened. The sewer is oval in shape, dimensions 26 x 32 ins. After a comparatively short term of service, it showed defects of so serious a character as to necessitate rebuilding portions. The remaining portion has disintegrated in many places and occasionally portions of the pipe are gone; the cement in places has the appearance and consistency of fresh lime mortar.

The Sixth St. main was constructed in the year 1892, the material being the best grade of common brick of home manufacture. The sewer is circular in form, 4 ft. inside diameter, two rings of brick laid on edge in imported Portland cement mortar, outside plaster coat ½-in. thick, not plastered on inside; all cement mortar one part cement and three parts sand. The masonry in the invert in this sewer is disintegrating throughout its entire length, the defects being confined almost entirely to the invert and lower sections of the manholes; the arch is apparently in good condition.

There is no subdrain under, nor on the sides of the sewer. As stated before, the disintegration in the Third St. main, where cement pipe was used, commenced soon after its construction, whereas the Sixth St. main gave no evidences of defect for about seven years after its construction, and it is only during the past four years that decomposition has been rapid.

The investigating authorities, after a complete examination of the location and condition of the sewers and the composition of the effluent, concluded that the decomposition was not due to any fault in the quality of the materials or the construction of the sewers or to the possible harmful attacks of the sewage. However, as the decomposition seemed greatest on the top and sides of the arch and as a white efflorescence was present at the most markedly affected places, it was thought advisable to look into the composition of the soil to determine the amount of alkali there present. Samples of the soil were therefore taken and chemical analyses made. It was found that as high as 1.3% alkali was present in the ground immediately surrounding the sewers, and furthermore that the amount of deterioration increased in just about the same proportion as the adjoining soil contained alkali.

This is as far as the investigation has progressed at present, but the work is being carried on and additional information is expected in the near future. The authors of the bulletin have not yet determined in what manner the alkali in the soil attacks a finished and hardened concrete, but suggest that the same general reactions may take place as occur in the attacking of concrete by sea water, which contains salts that interchange their elements with those of concrete, forming other salts that swell and expand to the ultimate destruction of the concrete. But just as the nature of this action in sea water is variously explained by different experts, so the effect of the alkali must be a matter of uncertain determination. A second explanation assumes that as the alkali is carried by water to and

*The Effect of Alkali on Portland Cement, by E. T. Tannatt, Rural Engineer, and Edmund Burke, Chemist. Bulletin No. 69, Montana Agricultural College Experiment Station.

through the cement concrete walls of the sewer, one or more bases in the alkali replace the calcium in the cement. This chemical reaction naturally would produce compounds which could be more easily carried away by the further infiltration of the ground waters.

The report further notes similar decomposing action on certain cement sidewalks and concrete foundations, and recommends a proper sort of construction in various kinds of concrete work to avoid the deteriorating effect of these alkali-bearing soils.

At practically the same time the attention of the U. S. Reclamation Service was called to a similar condition of affairs on the Sun River project, located near Great Falls, Mont., and on the Shoshone project in Northern Wyoming. The Service immediately instituted an investigation, which at present has not reached such a stage that its report would be valuable, but Mr. J. Y. Jewett, cement expert of the Service, read a paper on the present stage of the investigation before the June meeting of the American Society for Testing Materials, extracts from which will be given here.

Although a good many of the projects of the Reclamation Service are located in alkali regions, decomposition has been noticed in only the two localities mentioned above, thus showing that the peculiarities of the local soil are largely responsible for the trouble. The investigation so far as it has proceeded up to the present, is described by Mr. Jewett as follows:

On the Sun River project the effect has been seen in the disintegration of a number of small structures such as pipe culverts, which are partially submerged in the small streams carrying the drainage of the surrounding country. The effect of this water in causing the disintegration of the concrete is noticed, both in the softening of the material where constantly submerged for a period of three or four months, and also more particularly in the breaking up of the structure at the line where the water rises and falls or, in other words, where there is a submersion followed by a drying out, followed by another submersion, etc., which process brings about a breaking up of the structure, similar in appearance to that of the effect of freezing, only much more severe. This process is described by the engineer in charge of this work as follows:

On examination of some of the concrete culverts which have been in place in alkali water for three or four months, the part under water is much softer than the part above water, but the greatest effect of the alkali seems to be at the water surface. Have examined pieces of these culverts taken from below water level and found, by microscopic examination, minute crystals which disintegrate on being exposed to the air and become a fine powder. This process of crystallization has an enormous expansive force, the same as freezing, and this undoubtedly has an enormous disintegrating effect. One culvert which had been in alkali water several months had no strength at all and was like so much sand and mud at the water level.

Of course, in this case, as in any other case of concrete failure, the question of poor workmanship is one of the first to be considered and it should be noted that the work in question was carried on by force account under direct supervision of employees of the service and not by contract and was done in the usual thorough and substantial manner in which all of the construction work of the service is carried on, and after taking all the evidence into account there seemed to be no other conclusion to reach but that the action of the alkali water was directly responsible for the results noticed.

In studying the cause of this disintegration it seemed that a chemical analysis of the water producing these results would be the first step of importance to take and the results obtained from an analysis of this water are herewith presented as follows:

MILLIGRAMS PER LITER.

Calcium Sulphate	1,690
Magnesium Sulphate	6,870
Basic Magnesium Carbonate	305
Magnesium Chloride	192
Potassium Chloride	20
Total solids	9,077
Weight after ignition	8,855
Loss on ignition	222

From this analysis it will be seen that the principal mineral ingredient of this water is magnesium sulphate and this leads to the conclusion that the effect of this water in causing disintegration of concrete is similar in its action to that of sea-water in which magnesium sulphate is stated to be the principal substance acting to bring about the disintegration of concrete with which it comes in contact.

The next portion of the paper consists of a résumé of the well-known theories of the causes of the decomposition of concrete by sea-water as advanced by Le Chatelier, Michaelis and others. It then continues:

In connection with this matter of preventative measures to be used, the question of the materials used as concrete aggregates, and especially that of the sand used, is also of importance as having a possible bearing on the matter.

In the case of the sand used on the Reclamation Service project above mentioned, the engineers reported that there were evidences that this sand, which was the only supply readily available, contained alkali or some substance making it chemically active and assisting in the disintegration of the concrete. A chemical analysis was therefore obtained on this sand which resulted as follows:

	Per Cent.
Silica (SiO_2)	67.03
Alumina (Al_2O_3)	6.85
Ferric Oxide (Fe_2O_3)	2.50
Manganese Oxide (Mn O)	.02
Lime (Ca O)	10.72
Magnesia (Mg O)	1.72
Sulphuric Anhydride (SO_3)	Tr.
Alkalies: Soda (Na_2O)	1.74
Alkalies: Potassa (K_2O)	1.51
Water at 100° C.	.14
Ignition Loss	8.16
Total	100.39

This sand gives excellent results from physical tests but, as from the above analysis, it will be seen that the alkali content is about 3%, which would correspond to about 15 to 20% of feldspathic material and that it also contains a considerable percentage of limestone, it is altogether possible that this sand would be more readily acted on by the influences tending to disintegrate the concrete than a sand of a more highly siliceous nature.

As an appendix to Mr. Jewett's paper there is the following discussion of the subject, from the point of view of the cement manufacturer, by Mr. F. W. Brown, Superintendent of the Portland Cement Co., Portland, Colo.:

The matter of cement in connection with "alkali" waters has not been gone into thoroughly in any experimental way and there is much to be learned. It is perfectly safe to say that in the ordinary use of cement concrete the work is so carelessly done that there is always danger of the work being seriously injured from the infiltration of "alkali" solutions. The alkali salts are contained in small percentages in many of the Western clays, and are dissolved out by seepage water, which is usually strongly impregnated, varying from 50 grains per gal. to over 1,000 grains per gal. These salts vary in character according to the nature of the clay, the more common being sulphate of soda and sulphate of magnesia. There are many sulphates and carbonates present in small amounts, but these two are the only ones that have thus far been demonstrated to be injurious in practice. The sulphate of lime is injurious if the percentage is carried too high in the concrete, but this salt is so sparingly soluble that water containing it can seldom become so concentrated as to injure the concrete work, although it is possible that it might do so.

The basic cause of the injurious action is supposed to reside in the sulphuric acid, but whether or not this is the case is open to question, as the sulphates of magnesia and soda appear to be much more injurious than the sulphate of lime for a given amount of sulphuric acid. The evidence, so far as I have observed the practical condition, would indicate that it is the nature of the salt itself that causes the injury, while the percentage of salt present is readily indicated by a determination of the sulphuric acid. It is certain that the sulphates are far more injurious than the carbonates, or chlorides, but I attribute this more to the water of crystallization than to any other feature of the salts, since the sulphates alone carry very large quantities of water of crystallization, and the quantity that they carry is easily affected by their conditions, whether in solution or as dry salts, or whether acted upon by heat or atmospheric agencies, and I think in this peculiar characteristic is to be found the cause of their disastrous action.

In the case of sulphate of lime—so far as my experiments have gone—the amorphous state is the most injurious, while the uncalcined rock is very much less injurious when added to cement in large quantities than is the calcined products of the same rock. This is some evidence of the cause of injury.

There is another peculiarity of the sulphates which is believed to contribute to their disintegration of concrete; the sulphates very readily form double salts, that is, a simple sulphate will substitute a portion of its magnesia or soda for lime, iron or alumina, thus removing some constituent of the cement from the crystaline body, and substituting in its place a soluble alkali. These salts have been termed sulpho-aluminates, and it certainly is possible to obtain such a salt from the lixivation of the mortar made from a mixture of sulphates and cement, and it certainly is true [illegible] such cement mortar would be subjected to [illegible] evaporation of its water such crystals would [illegible] and be found in the mortar, but I do not [illegible] it is finally settled that this is the original [illegible] the original cause, as it may be more in the [illegible] a result.

But the fact remains that when cement [illegible] comes a depository of sulphates from infiltra[illegible] which are evaporated in any way from the [illegible] as to leave the salts behind, the percentage [illegible] in the concrete will continue to increase [illegible] stroys the concrete.

There are only two ways that I can see to [illegible] result in soils that contain such water: On[illegible] nish a natural drainage which will cut off the [illegible] permeating the concrete; and the other is to [illegible] the concrete that it is impermeable to water. [illegible] is not to be anticipated where the concrete [illegible] uously above or below the high and low water [illegible] such water in the soil. I have seen the conc[illegible] embankment where the upper portion of the [illegible] above high water mark of the alkali water, [illegible] lower portion of the apron was below the [illegible] mark, and was standing in alkali water which [illegible] over 1,000 grains to the gallon of magnesia [illegible]. This concrete had been in this condition f[illegible] years, the upper portion as well as the subm[illegible] portion were practically sound and solid, while [illegible] intermediate, on which atmospheric evaporation had acted had absolutely disintegrated into a plastic mo[illegible], apparently such as ordinary lime mortar when ready for plastering. This intermediate portion was a 1 to 3 mixture of sand and cement and contained over 3% of sulphuric acid in the concrete itself, which would be equivalent to about 40% as much sulphuric acid salts as there was of Portland cement present. We have concrete work of 1 to 6 mixture in cisterns and wells at our plant here at Portland which have stood in alkali water for over six years without a particle of injury, and yet wherever concrete or ordinary character has been acted on part of the time by water and part of the time by the air it has shown signs of disintegration in a small way, so that the actual danger resides in the action of the atmosphere upon the sulphuric acid salts, which causes them in turn to act upon the lime of the cement changing it from the crystalline lime to the amorphous form, which not only swells but dissolves and is thus removed from the cement causing its disintegration. The practical remedy in such a case would seem to be in the use of cement containing a very low percentage of lime, as this injurious action appears to increase rapidly with the increase of the excess lime of the Portland cement, and it has been found that any provision in the manufacture of Portland cement which assists in making the excess lime a permanent chemical component of a mineral will overcome this action of the sulphate salts.

The state of burning in the kiln, the fusibility of the clinker, the sluggish activity of the cement, all are accompanying characteristics of the cement which has large power in resisting the action of these sulphates, so that it is not to be doubted that when the demand shall arise the Portland cement manufacturers will find means of providing cement which will withstand the action of these alkalies in concrete if the cement is only given a fair show in the construction of the concrete. This is a matter which will require much painstaking, thorough, and unprejudiced experimenting before the whole proposition is made clear, and the means of obtaining the desired result is made positive.

GREASE FROM THE SEWAGE OF BUXTON, ENGland, is utilized as a lubricant for the crusher which breaks refuse-destructor clinker for use in filling the sewage filter beds. The grease is collected from the sewage tanks and subsequently rendered. Mr. W. H. Grieves is town surveyor of Buxton. The foregoing information is taken from a brief description of the Buxton works, in the Proceedings of the Association of Managers of Sewage Disposal Works for 1907 (Chas. H. Ball, Secretary, Charlton-cum-Hardy, Manchester, England).

VACUUM CLEANERS of a great variety of arrangements have appeared in the comparatively short time since the appearance of the first. The majority appearing on the market seem to have some form of rotary pump or high-pressure blower. One of the latest and most novel types, and, it is claimed, one of the simplest and cheapest, is that put out by the Palm Engineering Co., of Detroit, Michigan. The pump is a plunger type with a loose piston. Vacuum is held by this piston with water packing which also eliminates the friction and wear of a close-fitting piston. No dust separators are used to prevent the dirt reaching the working parts as in other systems, thereby increasing the efficiency of operation. The apparatus is operated by a direct-geared (Westinghouse) motor of ½-HP. capacity upward, depending on the size of the apparatus. The motor is easily controlled at a distance.

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The active discussion some years ago over the proposal to make engineering a "close" profession, is called to mind by the announcement that the State of Louisiana has actually passed a law requiring the registration of all civil engineers and surveyors. Anybody practicing before the law was passed can go on the registry list regardless of his qualifications or lack of qualifications. Hence until in the course of nature the incompetents and dishonest hangers on of the profession have the goodness to die or remove from the state, the public will still have to be on its guard in employing engineering talent.

The law is intended, we suppose, to protect the public against the results of incompetent engineering work. It is said that the charlatan is abroad in the South and that Southern towns and cities are being mulcted of vast amounts of money through badly planned water-works, sewers, lighting plants, streets, etc.

Admitting this to be true, we do not see how the Louisiana law—or any other law of this sort which we have ever seen—is going to protect the public by preventing the employment of incompetent engineers. We call to mind two or three specimens of the sort that get cities into trouble, and each of them we are sure would pass any examination the state board would give and come off with flying colors.

If Southern towns and cities need some assurance that their money laid out on public improvements is spent to good purpose, they must go at the task in a different way. Something corresponding to Great Britain's "Local Government Board" is needed in every state of the Union, north as well as south, to prevent cities from wasting money on poorly planned public works. The way to prevent cities from employing incompetent engineers is to require plans to be submitted to a state board authorized to reject plans that in the public interest ought to be rejected.

A beginning has been made by the State Boards of Health in the supervision of water supply and sewerage systems and by some state engineers in the inspection of highway bridge plans; but there is room and need for a vast increase in this state supervision. We believe that engineering societies will benefit the public and the profession far more by seeking legislation to this end than by attempting to make the profession a "close" one.

An examination of the superficial evidence of the wreck of the Cazadero hydro-electric plant on the Clackmas River, near Portland, Ore., brings out the evident partial responsibility of the designers of the plant, and brings to mind some recent protests from the designers of electrical machinery that the limits of speed were being neglected by engineers engaged in the development of power projects.

In this particular case it may be argued by some that the turbine governor was primarily to blame for going out of action. No manufacturing concern, however, can be expected to make a regulating apparatus absolutely reliable under all conditions in the hands of unknown operators. Then, the designers of the power plant should not place implicit confidence in the complete infallibility of regulation by any governor. Instead they should predetermine the maximum speed possible under the most unfavorable conditions with the existing turbine design. That this maximum speed was known and provided for, in the Cazadero turbines, is evident from the statement in the account of the accident given elsewhere, that the turbines themselves were practically uninjured. The stresses in the generators from such maximum speeds can be successfully carried if such limits are demanded by the plant designers. With such provision against the explosion of the rotor the station units can withstand a bombardment of missiles without great danger of explosion.

The Cazadero station has been generally considered a well-designed one, and this accident may well serve as a warning to designing and operating engineers generally to make a few computations and enquiries as to the ability of their own apparatus to withstand such excess speeds. In many cases it will be found that the maximum or runaway speed provided for in the turbine design was not furnished to the electrical manufacturer as one of the conditions under which his machines might have to operate successfully. It is reported that the specifications for the new generators of the Cazadero plant require the ability to withstand the maximum theoretical turbine speed for one hour. No designer likes to have his machines explode merely that new ones may be designed and built, yet under stress of competition the manufacturer also "may take a chance" to better secure a sale. In the end it is the investor who loses—the one who relies on the ability and foresight of the designing engineer to provide against such improbable but not impossible troubles.

In our issue of July 2 we commented on the strength clause in the standard cement specification of the American Society for Testing Materials. We print in our correspondence column an explanation of the "reasons why" that governed the framers of the specification, which will doubtless serve to make clear what was not clear to us and very likely has not been to many engineers who have read the specification.

As stated in the letter, the specification as framed by the committee was not meant to be a cast iron rule to be copied verbatim by the engineer. Instead it was deemed wise to leave some latitude to the discretion of the engineer, and so instead of stating a standard minimum strength to which the test briquettes must conform, limits were given between which the engineer could make his choice according to his preferences for a high test cement or a low test and according to the facilities and experience of his cement tester.

We believe this specified range of minimum strengths has been at times misunderstood to mean that cement shall not test above the maximum limit named or below the minimum. The specification says plainly, however, that "The *minimum requirements* for tensile strength for briquettes 1 in. square in section shall be within the following limits."

The footnote added appears to be for the benefit of those who adopt a specification on its reputation without even reading it over to see whether it is actually a complete specification or a form upon which the engineer can impress the results of his own knowledge and experience. Viewed with this understanding there seems no reason for objecting to the addition of the footnote, which is the amendment proposed.

Optimistic people when urged to lend their influence for forest preservation and restoration sometimes say that cement and concrete are going to take the place of lumber and so reduce the drain on the forests. Perhaps the prediction may be realized, but the figures for lumber production in 1907 give no hint of such relief. Lumber production is growing instead of falling off. The total of 1907 was 3,000,000 M. ft. greater than in 1906, and exceeded 40 billion ft. B. M.

THE EFFECT OF ALKALI SOILS ON CONCRETE.

During the past three months the western part of this country has been flooded with literature attacking the integrity of concrete as a building material, especially in sewers and drain pipes subjected to ground water. The main contention of these attacks has been that in the course of time, fifteen years at the most, all the cement in the concrete would become separated from the aggregate and blow away, leaving a mere noncohesive mass of stones and sand; a statement so fanciful, in the light of our past knowledge of the behavior of concrete, that it seemed even more malicious than the usual biased utterances of both sides of the publicity campaign now being carried on by the cement and clay interests. However, the recent investigations of the Montana State Agricultural College and the U. S. Reclamation Service into the effect of alkali soil on concrete, reveal the basis of the widely circulated attacks and show that, though greatly exaggerated, they have some foundation on facts which will bear the most thorough study, both in search of a cause and of a remedy.

Briefly, the published investigations show that, in some localities, concrete subjected to the infiltration of water through an alkali soil decomposes, principally between high and low ground water, somewhat after the fashion so often noted in similar structures in sea water. While such action can affect but a small field of construction, the great amount of concrete work now being carried on in the west by both federal and private interests make further investigation imperative. At present we have only two reports on the matter, neither of which claim to be very thorough, but it is understood that in addition to the continuance of the investigations of the Montana authorities, the United States government is making an exhaustive study of the whole subject through its experts in the various technologic branches of the service. Until these reports are published, no adequate explanation of the source and remedy for the deterioration can be made, but it may be well to look into the similarity of the conditions existing in sea-water and alkali washed structures and to the theories advanced for their protection.

As most of our readers know, the behavior of concrete in sea water is hardly uniform and not a matter of exact explanation. In many places where concrete has been exposed to the ocean water for long periods the structure is in just as good condition as though it were in air, while elsewhere the deterioration, especially between the high and low water marks, has been most marked. Aside from the convenient theory that poorly made concrete is to blame, always offered in explanation of every accident where concrete is involved, this erratic behavior has never been explained, though the general theory

of the decomposition is that certain salts of the sea water, magnesium sulphate particularly, enter into combination with the calcium and aluminum in the concrete to form a calcium sulpho-aluminate, which crystallizes in the atmosphere, swelling and cracking the concrete.

The conditions in concrete exposed to alkali water and that exposed to sea water are alike in two things; the chemical makeup of the water and the alternate wetting and drying of a certain portion of the face. Sea water consists of about 3% total solids, principally the sulphates of sodium, magnesium and calcium; alkali water, as shown in the two analyses given in the article on another page, consists of from 1 to 2% solid matter, principally the sulphates and carbonates of the same elements noted above. The chemical action then should be about the same, with perhaps a less intensity in the alkali waters. The second similarity, the alternate wetting and drying of the space between high and low ground waters or tides, is responsible for the crystallization, by exposure to the drying effects of the atmosphere, of the salts which cause the swelling and cracking of the concrete.

There is one difference between the two conditions, however, that is very important. That is the absence in concrete in the alkali country of any physical action against the face of the wall which would tend to break up the external structure and allow the decomposing water to attack the more porous and hence more vulnerable interior. This breaking up of the intertidal space in ocean structures, by the batter of the waves, the movement of ice and other floating objects, has been thought to be largely responsible for the deterioration so often observed in such cases. In the alkali-exposed concrete, on the other hand, there is nothing but the gentle infiltration of water, and whatsoever action takes place must be purely chemical at the start, with no physical aid. In this fact partly lies the hope of future protection for the concrete in the alkali lands. It is probable that in the past no great effort has been made to build the ordinary concrete non-porous or waterproof, so that the usual hard surface found in well tamped faces and the dense mass resulting from well mixed and laid interiors were not present and the attacking water readily formed its crystals in the many pores of the concrete. In future, in addition to a probable use of iron ore cement or included clay or pozzulana, a more careful attention will be paid to the forming of an impervious concrete which, with its dense face, should be able to prevent the intrusion of any of the salts which combine to form the destructive crystals.

It should be noted, too, that concrete in an alkali country is generally made of alkali-bearing materials. The report of the Reclamation Service shows a sand high in soluble salts and doubtless the mixing water was of like composition. This is a real source of danger because thereby the attacking salts are introduced into the interior of the mass and, although the action of setting concrete is at best an unsettled question, it is quite certain that chemically active elements have a much more pronounced effect upon a setting concrete than upon one which has not reached a final set. In addition to a dense mixture, therefore, care should be taken to avoid alkali-bearing material in the concrete.

The present status of the situation is that in at least two localities having an alkali soil some peculiar condition of the soil or the concrete has brought about a pronounced deterioration in certain concrete structures; that the indications are that the causative action is of a like nature to that observed in mass concrete partially submerged in sea water, but that in the present state of knowledge, no definite cause can be assigned or absolute remedy prescribed. Meanwhile the profession will look with considerable interest for the reports of the government experts on the subject, for if a hardened concrete not exposed to any pronounced physical wear can be completely destroyed by the gentle infiltration of water through a not uncommon soil it is high time that we were certain of our facts and that some definite study be made to prevent such an occurrence.

LETTERS TO THE EDITOR.

Comparing Tunnel Driving Records.

Sir: Some discussion having occurred recently concerning rock tunnel driving records, my attention was called to the letter concerning "Rapid Work on the Raton Tunnel" on p. 489 of your volume 59.

It is well to have as many reliable records as possible of work actually done, but when the records are to be compared the conditions must be similar. The real records in rock tunnel work have been made with rock drills working in hard rock. In the Raton tunnel I find that the material was soft sandstone, shale and coal, and the perforating instrument principally employed was a coal auger. There were six headings, but at only one of these was it possible at any time to work without following up closely with timber.

"The timbering consisted of a six-segmented arch made of 12 × 12-in. timbers 3 ft. c. to c. Lagging consisting of 3 × 10-in. and 4 × 10-in. native pine, was used over the segments, which rested on a 12-in. sill at the spring line. All the timbers from the 12 × 12-in. upward were placed as fast as the excavation in the heading permitted, and the spaces over the lagging were packed solidly with rock. *As fast as the steam shovel took out the bench*, posts were set under the 12 × 12-in. sills."

The above is quoted (italics mine) from the published account of Joseph Weidel, assistant engineer. Could this properly be called a rock tunnel at all? It was lined with concrete 2 ft. thick and the "rock" taken out was not even suitable as a constituent of the concrete, this having been separately quarried elsewhere. The work was good engineering, but the record of it does not belong in the line of true rock tunneling.

Frank Richards.

11 Broadway, New York City, July 10, 1908.

[In this connection we have just received information of the progress made in the month of June by Winston Bros. & Co. on the Chicago, Milwaukee & St. Paul Ry. tunnel through the Bitter Root Mountains in Idaho and Montana. The record is as follows:

	Heading.	Bench.	Tunnel.
East End	203 ft.	327 ft.	265 ft.
West End	333 ft.	304 ft.	318½ ft.
	536 ft.	631 ft.	583½ ft.

Complete Tunnel for four months.....2,082½ ft.

Owing to bad rock the East End heading made only 40 ft. in 12 days.

The progress made in March, April and May on this tunnel was reported in detail in our issue of July 2, p. 9. The record above given of 333 ft. for the west heading is probably the record rate of progress on American railway tunnels driven the full width of the arch in hard rock.—Ed.]

The Strength Clause in the Cement Specification.

Sir: In your issue of July 2 there appears an editorial on the proposed change in the standard cement specifications of the American Society for Testing Materials, which may tend to confuse your readers.

When the specifications were first adopted it was supposed that the engineer or architect using them would specify, within the maximum and minimum range of strengths given, that which must be developed by the cement to meet his particular requirements. With this thought the minimum was fixed as low as could be safely used and yet secure the furnishing of a true Portland cement. On the other hand, the maximum was placed at as high a point as was considered safe to ask without imposing hardships on the manufacturers, whose product must test above the maximum if this maximum was used by the engineer in writing his specifications. The figures given indicate the range considered allowable in specifications for the strength of cement.

In practice it was found that many engineers and architects did not insert in their specifications any definite requirements as to strength, but simply stated that the cement was to be tested in accordance with the standard methods and must pass the standard requirements and it was to meet such cases that the footnote was added.

If this should be adopted, the engineer or architect would still have the same liberty as heretofore in specifying the strength requirement that best suited his purpose, but if he neglected to do so the footnote automatically fixes the strength required of the cement to pass the specifications and the manufacturer cannot with the proposed change insist that the minimum was meant or the engineer or architect insist that the maximum was required.

While the writer fully agrees with you on the advisability of "definiteness of specification," it would hardly seem possible to prepare a standard specification for cement that would meet all conditions without some variation in the requirements as to strength to meet each special case.

Very respectfully,

Henry S. Spackman.

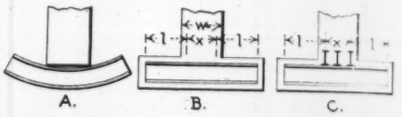
Philadelphia, Pa., July 7, 1908.

[We have referred to this matter to our editorial columns.—Ed.]

Moments in Grillage Beams and Projecting Footings.

Sir: In your issue of June 18, 1908, your correspondent "R. F." goes to great length to "prove" the falsity of some methods of designing grillage beams. He would be more forceful if he used a correct method himself. My purpose in writing this is not to point out a correct method, but to show that such a method is not possible, and that a close approximation based on reasonable assumptions is all that can be attained.

"R. F." quotes from "Structural Steel" of the Bethlehem Steel Co. what he claims is the correct treatment of the case, as follows: "Loading is uniformly distributed over the length on which it is applied and the beam is uniformly supported from below over its entire length. Maximum bending occurs at the center of length of the beam." The first part of this statement is wrong. The loading is not uniformly distributed and cannot possibly be. A rigid block, such as a stone or concrete wall, might distribute its pressure in approximately uniform manner over a yielding base, such as the soil of a foundation; but a deflecting needle beam yields or deflects and changes the uniform distribution of bearing.



As illustrated at A in the accompanying sketch, the deflection of the beam relieves the middle of the wall from pressure, and, instead of the load of the wall being uniform for its width, that load is thrown near the edges. Of course it would not be correct to take the extreme edge of the wall as the point of application of the load, as this would give no width for bearing. In my book "Concrete," pages 224, 345 and 355, I recommend on a 24-in. wall that the sections for moments be 18 ins. apart, the span being *l* for a cantilever taking the upward reaction of the soil. [See sketch at B.] I also recommend that where there is an upper tier of beams, as at C, the center of the outer beam be used as the center of moments. Under a cast base or a built shoe a similar allowance can be made.

An analogous condition occurs in pins having extra wide bearings. For example, a pin in a cast-steel shoe may have a bearing over 6 ins. or more, when an inch or two would be sufficient. It would be unreasonable and incorrect to say that the load of this rigid shoe, sometimes much more rigid than the pin itself, is uniformly distributed over the full length of pin embedded in it. It is sufficiently accurate and quite safe, though only an approximation, to count out the surplus bearing area on the pin in computing the bending moment. In the same way the surplus width of the wall resting on needle beams can be counted out.

Yours very truly,

Edward Godfrey.

Monongahela Bank Bldg., Pittsburg, Pa., June 20, 1908.

Notes and Queries.

C. H. M., Seattle, Washington, writes:

Do you know of any records concerning existing reservoirs of considerable age, showing what the tendency is to fill up with silt? I do not recall having seen any data upon that subject, but I am curious to get hold of some if they are in existence.

We know of no such published records anywhere and refer the inquiry to our readers.

G. H. N. writes:

We have a very pretty building, built of logs and bark. I find that worms or borers are in the arborvitae logs and I believe it will be only a question of time when they will commence on the yellow pine logs and rafters. Do you know of any practical way of killing the insects that could be applied to the logs in the building? Would the treatment discolor the bark so as to spoil the effect we now have in the natural color of the bark?

The only two insecticides that would seem to promise any success are hydrocyanic acid gas and carbon bisulphide. Both would require extreme caution in handling, the first because it is deadly poisonous to breathe and the second because of the danger of fire or explosion from any chance spark.

THE PLACE OF SHOP TRAINING IN ENGINEERING EDUCATION; PAPERS AND DISCUSSIONS AT THE RECENT CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Three papers were presented, at one session of the recent convention of the American Institute of Electrical Engineers, bearing on the place shop training should have in the engineer's early education. The first of these, "A New Method of Training Engineers," was by Mr. M. W. Alexander, of the General Electric Co., Lynn, Mass. The scheme proposed was simply the familiar co-operative scheme with the alternative periods beginning with a length of one month and increasing to five.

Mr. D. L. Rushmore, of the General Electric Co., Schenectady, N. Y., presented a very general dissertation on the place occupied by college graduates in the organization of a large manufacturing concern. His remarks were on topics like the variety of men needed, additions to an organization, initiative and development in individuals, influence of college activities in after life, bringing students and instructors into touch with actual commercial conditions, etc.

The third paper was by Mr. B. A. Behrend, Chief Electrical Engineer, Allis-Chalmers Co., Milwaukee. Mr. Behrend emphasized the fact that it was the aim of every great concern to fill its responsible positions with men of exceptional ability—whether the times were "hard" or not. Such men as were desired needed be men of integrity, of moral courage and of intellect. Men with one or two such qualities could be obtained, but those possessed of all three were scarce. Character and intellect were to be cultivated by manufacturers and colleges by any cooperation possible. The discussions on these three papers were given on them as a whole, and indeed surpassed in interest and practical value the papers themselves. The discussions soon left the comparatively narrow limits indicated by the titles of the papers. The ideas of shop training, however, formed the starting point about which the discussions spiralled.

Professor J. P. Jackson, Pennsylvania State College, opened the battle by stating that if college graduates were being put out into work not equipped as the practicing engineers would have them, that these engineers were to blame, for no teacher could hold his job against the criticism of the practicing engineers. If these men would make their demands known methods and curricula would soon shape themselves as desired. The fault was laid to the practicing engineer for leaving the colleges too severely alone, and all prominent engineers were to be reminded that they should constitute themselves "consulting professors and instructors" to such technical schools as they chose.

This speaker paid his respects to those who would have the engineers study more history and demanded that they first reform the study of history. At present "the student could learn all about Henry the Seventh's breakfast, or Queen Elizabeth's toilette," but could learn nothing of the influence of the greatest scientists and economists in shaping the destinies of the races.

Mr. B. A. Behrend in the discussion urged the consideration of facts and conditions in seeking to implant "cooperative courses." The very obvious state of affairs at such institutions as Cornell, Stamford, Pennsylvania State was exhibited, where such close access to large manufacturing concerns positively could not be obtained. Indeed there were only a half-dozen places where the men could get a sufficient variety of work to serve them for more than mere handicraft apprenticeship. Mr. Behrend contended that moreover Mr. Alexander's method prevented continuous and concentrated thought. A real problem requires more than a week or a month of careful thought and close application to theoretical work. Where shop instruction so greatly breaks into the presentation of theory the whole time, he claimed, would be frittered away. The co-operative plan was held up as excellent for trade schools, but as a most vicious one for universities whose function should be for the highest phases of instruction.

Professor Morgan Brooks, University of Illinois, maintained that the boys entering the technical schools were too young to take up shop work as thoroughly as the cooperative scheme implied. He also held that such alternations at school and in the shop would make it impossible for any student to take part in the student activities and that such life was a great factor in the development of the individual. So many students, moreover, required such a widely different range of elective culture studies, that in an ordinary school these courses would be completely broken up. Two or three cooperative students in each course would require special instructors in such courses.

Mr. Ralph W. Pope, Secretary of the Institute, described one of the tribulations of his position—the frequent appeals for advice. Parents asked whether their boys should study electrical engineering or medicine. One bookkeeper wrote asking whether law or electrical engineering was the more crowded field. The point he made was that technical education should begin with the parents, who did not know what to do with their children.

Professor H. H. Norris, Cornell University, said that it should be remembered that educators had to plan for average men. The brilliant ones and the dullards were taken care of automatically. He claimed that, from observation, (1) the average man takes more interest in using his hands than his brains; (2) there is always a time lag in starting up after a mental change such as a vacation; (3) with the knowledge that work is to stop at a certain time the interest drops as the time approaches; (4) as students prefer practice to theory, just enough facts to serve as mental tools should be provided; (5) the principles of manufacturing can be taught better in a college shop than in a commercial plant.

Dr. C. P. Steinmetz said he could discuss the question from both points of view—as a manufacturer and as a professor. As a professor, he realized that there were innumerable things which it would be fine to teach if there were a ten-year course. The school should teach only what the students cannot learn in practical life. It would be necessary to so limit the course to bring it into four years. Such subjects would be general culture, mathematics, mechanics, physics and chemistry.

He said, as a user of men, that, if a young man could immediately drop into a place and completely handle the work of the position, he would regard with great suspicion the college that sent out the man for fear they were teaching only what the man could learn outside.

Another serious defect claimed was of the inefficiency of the education through trying to work up into engineers the whole available number of boys dumped into schools without regard to their inherent fitness for the work. This was likened to a manufacturer who might try to work up all the iron received in a shipment into transformers—with no waste from cutting or punching. Such a condition did not obtain in other professions. This wasted the educator's time, which might better go to the proper men, and in addition spoiled the character and ruined the ability of the student by keeping him where he did not belong. The born engineer was thus kept back by teachers who attended to the lazy and the incompetent. In Germany, it was said, the students were allowed, and assisted, to go to the height of any possible knowledge as their inclination directed. That condition did not obtain in this country, it was claimed, and explained why so few great men graduated from American schools.

Professor D. C. Jackson, Massachusetts Institute of Technology, said that as far as education was concerned—progress was a physiological and a psychological question. He held that there was no need for pessimism; that there was as good basis to-day for the development of great engineers as there had been for the development of Newcomen, Watt or any great inventor. The greater engineering schools were to produce the great engineers. Engineering education was held to be primarily a professional education and was to be regarded in the same light as courses in law and medicine. Through the efforts of the various law and medical associations these courses are now maintained as fully professional schools. Along with the study of the philosophy of law there was the study of cases, and along with the theory of scientific healing practical experience in clinics was necessary. The cooperative plan, it was claimed, was a strong argument for the professional school, and its promulgation would do as much for engineering schools as similar agitation has done for law and medical schools. To this end it would not be necessary to have the engineering school near a large shop. The isolated institutions could work this out in their own shops.

Professor Comfort A. Adams, Harvard University, spoke to refute much that Professor D. C. Jackson said. He claimed that the analogies quoted were not at all parallel. The law students did not go into the courts and argue the cases; they studied the results. The M. D.'s must necessarily go out sufficiently equipped to hold a man's life in their hands and no engineer had such responsibility thrust on him on graduation. The prosperity of a concern or the lives of employees did not rest on him.

A course to be followed at Harvard was described briefly. This was somewhat after the ideas of Dr. Steinmetz. The student comes to college, but does not enter a professional course immediately. He takes a preliminary undergraduate course leading to a degree of B. S. or A. B. (general), in three years. If his tastes develop in the right direction some of his preliminary studies may be directed along engineering lines and at the beginning of the fourth year he enters the graduate school of applied science where he registers to begin or to extend his real engineering work.

Professor A. F. Ganz, Stevens Institute of Technology, said that the plan of Mr. Alexander would cut the theoretical work of the colleges to three years by the elimination of laboratory work. This laboratory work could not be cut out without great detriment, for the men were competent to seriously take up real engineering work only during the third year, after they had obtained some foundation knowledge of science and culture. It was said that alternate weeks of theoretical and laboratory instruction had been tried at Stevens Institute, but the time lag at transition periods had proved too great.

Mr. C. F. Scott, of Pittsburg, made a plea for a broader view of technical training. He held the view that the most of the discussions on engineering education tended only to produce a better human slide rule. The companies wanted a man improved for their own ends and purposes rather than for his benefit. They would have him developed into the highest type of engineer, for their own service, and to this end they asked for certain studies and certain periods of other training. This speaker hoped to see the class of education developed that would give "soul-purpose, consciousness of life and object of effort." This training could be obtained only from a real teacher and could be had with such whether there was a great shop nearby or not; whether there was a great or a small laboratory equipment. He also claimed that the average college student, under present methods, asked that the theory be crammed down him; that the student's attitude was one of passive absorption; that the shop training was regarded by the student as an opportunity where the company was glad to have experience plastered onto him with a minimum effort on his part.

Mr. G. S. Dunn, Chief Engineer of the Crocker-Wheeler Co., Ampere, N. J., speaking from a manufacturer's standpoint, believed that the most successful man was one who had had some taste of practical work, during his course, such as summer experience. This preliminary touch between the manufacturer was essential perhaps, but it was held not to be necessarily as intimate as Mr. Alexander's plan required. Mr. Dunn said that college men were better than others not so much on account of what they learned during their course, but because of the experience and discipline of living with other young men. The

average college man was pictured as without much directive force—undeveloped and an early submission to shop discipline would be a discipline.

There was one objection to the cooperative plan urged from the manufacturer's standpoint. If this plan were to become general, all the shops must take their quota of students and the shops would be filled to the detriment of output.

Mr. E. R. Taylor, of Penn Yan, N. Y., very briefly urged the extension of the manual training school in all the towns and cities. This would develop the natural tendencies of the boys and aid in determining a proper field for their life's work.

THE ANNUAL CONVENTION OF THE AMERICAN BOILER MANUFACTURERS' ASSOCIATION.

The twentieth annual convention of the American Boiler Manufacturers' Association was held in Atlantic City on July 14, 15 and 16 at the Marlborough-Blenheim Hotel. About 125 members and guests were in attendance.

Mr. T. M. Rees, of Pittsburg, First Vice-President, presided at the sessions in the absence of the president, Mr. M. F. Cole, of Newnan, Ga. In opening the convention Mr. Rees reviewed the efforts of the association in bringing to the attention of the state and national authorities the needed improvement in the inspection of land and marine boilers and in seeking the necessary revision of regulations into accord with changed conditions. He congratulated the association in the action of President Roosevelt in appointing a commission to examine the laws of the United States for the better security of life at sea, with a view to their proper revision and change, that public interest seems to require. Mr. Rees reminded the members of the association that it was their duty to bring before this commission all information and data that would tend to facilitate its work and advise concerning modern requirements. This assistance was held to be of greatest importance because of the bearing of federal laws and regulations on state and municipal legislation and on greater uniformity of practice. Mayor F. P. Stoy extended the formal welcome of Atlantic City with the usual round of compliments. The entertainment features of the convention were numerous and varied and included automobile, yachting and trolley trips, theater parties, visits to the amusement piers, ocean bathing, a rolling chair procession and a banquet.

At the second session of the first day there was an informal discussion on matters of very general interest. Col. E. D. Meier, of the Heine Safety Boiler Co., gave a history of the movement for uniform boiler-inspection laws. Mr. W. L. Hirsch, representing the Carnegie Steel Co., made several remarks on the difficulties encountered by the steel makers in their endeavors to eradicate impurities and on the great amount of study and investigation, both theoretical and practical, carried on to improve their product.

At the Wednesday afternoon session Detroit was selected as the next place of meeting (1909), and the following officers elected to serve for the ensuing year:

President, E. D. Meier, New York City.
Secretary, J. D. Farasey, Cleveland.
Treasurer, Jos. F. Wangler, St. Louis.
First Vice-President, T. M. Rees, Pittsburg.
Second Vice-President, J. Don Smith, Charleston, S. C.
Third Vice-President, W. A. Brunner, Phillipsburg, N. J.
Fourth Vice-President, H. D. McKinnon, Bay City, Mich.
Fifth Vice-President, M. A. Ryan, Duluth, Minn.

PAPERS AND DISCUSSIONS.

REPORT OF COMMITTEE ON UNIFORM SPECIFICATIONS.—Two important developments in boiler practice were the subject of a long discussion by this committee; these were the passage of the Massachusetts statue relative to the operation and inspection of steam boilers and the appointing, by President Roosevelt, of a Commission on Revision of Laws Relating to Safety of Life at Sea. It was maintained that both these good results came indirectly from the long and persistent attempts of this association to secure uniform and strict rules for the construction and operation of steam boilers.

The report then takes up in considerable detail the evidences of similarity in the Massachusetts requirements and the specifications of this association and of the American Society of Testing Materials. This committee claimed that there was no sound reason for permitting a higher percentage of phosphorous in acid steel than in basic and that the allowable amount of sulphur was too great in all classes of boiler plate. The committee held that the provisions of the Massachusetts statue in demanding drilled rivet and tube holes was unnecessary. The reason assigned for the insertion of this clause, which also appears in the latest rules of the Steamboat Inspection Service, was that some shops might use inferior iron and dull punches, with the accompanying danger of starting incipient cracks. As boiler makers have claimed that greater accuracy of work could be obtained by punching and reaming with no loss of strength, the chairman of this committee, Col. E. D. Meier, made

a series of tests, covering two samples each of large holes punched, simply; punched and reamed; punched, reamed and annealed; and drilled with the cutting drill. These were marked merely for identification and submitted to a well-known, conscientious expert for test with the distinct understanding that he should not be told how the holes had been prepared until after he had completed his report, and he agreed not to examine them critically with a view to determining for himself. The tests showed, it was claimed, that there was absolutely no difference in the strength of the plates prepared by different processes and in no case did the break start from the hole.

The closest scrutiny of boiler materials is of prime importance and a material that cannot safely be punched is not fit to go into a boiler at all.

The Board of Boiler Rules of the State of Massachusetts has for its chairman the Chief Inspector of the Boiler Inspection Department, and the other members represent boiler using, manufacturing and insurance interests and operating engineers. They have covered many points and done excellent work in the preparation of these rules and have always been ready to weigh and consider all reasonable suggestions. We believe that they will be ready to modify and improve their rules to make them the best ever formulated. The natural consequence will be the acception of such rules by other states and a gradual but sure approach to uniformity throughout the country. In this we should cooperate and your committee suggests that every member supply himself with a copy of these rules, which will be gladly furnished on application to Mr. J. H. McNeill, Chief Inspector, Boiler Inspection Department, 15 Ashburton Place, Boston, Mass.

The report was received and the committee was continued. A special edition of the report was ordered printed and widely distributed in accordance with the regular proceedings.

NECESSITY FOR UNIFORM LAWS.—Mr. H. J. Hartley, of the Wm. Cramp & Sons Ship and Engine Building Co., Philadelphia, presented a contribution on this subject, discussing the importance and feasibility of uniform national inspection laws. The paper contained a resumé of general boiler construction and operation; the care for safe operation; the present insurance inspection during and after construction; and method of hydrostatic tests.

A thousand copies of Mr. Hartley's paper were ordered printed for wide distribution before the appearance of the regular proceedings.

In the discussion, Mr. W. L. Hirsch, of the Carnegie Steel Co., said that the steel makers wished to cooperate with the boiler makers in every forward movement for the conservation of life and property. He took up the situation that would arise if every state had a different law for boiler construction inspection. Then it would be impossible for the makers to conform to them all.

MISCELLANEOUS DISCUSSION.—The sessions of the final days of the convention were given over to informal topical discussions.

The relative height of boiler stacks for different altitudes seemed to arouse a [illegible] interest. It was evident that [several] had found trouble from undere[stimation] necessary additional height of sta[ck] level requirements. Col. E. D. Me[ier] a satisfactory rule that it was we[ll] the height about 8% for each 1,0[00] tude. The grate area was to be [based] the square root of the stack incre[ase]. It was not considered sufficient to merely [increase] area. It was also necessary to [provide] cient area of openings under the g[rate] the increased amount of air.

Mr. H. J. Hartley said that it ha[d been found] generally satisfactory in stationary [work] 25% to the area of the fire tubes for [each square foot of] the stack.

The majority of the discussions [were] to personal experiences with iron [and steel] rivets, methods of using staybolt[s] and with steel and iron flues.

Plans were discussed for securing [a] for the Committee on Uniform Spec[ifications] fore the Commission on Safety of [Life at Sea,] to secure recognition of the work [of the committee] and the incorporation of [the] desired rules in the requirements of the commission.

STATISTICS OF RAILWAYS IN THE UNITED STATES FOR 1907.

We printed on p. 33, of our issue of July 9, statistics of the railways of the United States for the year ending June 30, 1907, taken from "Poor's Manual." The official figures of the Interstate Commerce Commission were given out last week and we extract those of most interest to our readers:

MILEAGE.

The report shows that on June 30, 1907, the total single-track railway mileage in the United States was 229,951 miles, or 5,588 miles more than at the end of the previous year. The aggregate length of railway mileage, including tracks of all kinds, was 327,973 miles. This mileage was thus classified: Single track, 227,454 miles; second track, 19,420 miles; third track, 1,960 miles; fourth track, 1,389 miles, and yard track and sidings, 77,749 miles. These figures indicate that there was an increase of 10,892.07 miles in the aggregate length of all tracks, of which 3,988 miles, or 36.62% represented the extension of yard track and sidings.

EQUIPMENT.

On June 30, 1907, there were in the service of the carriers 55,388 locomotives, the increase being 3,716. These locomotives, excepting 1,237, were classified as: Passenger, 12,814; freight, 32,079, and switching, 9,258.

The total number of cars of all classes was 2,126,594, or 167,682 more than for the year 1906. This rolling stock was thus assigned: Passenger service, 43,973 cars; freight service, 1,991,537 cars, and company's service, 91,064 cars. These figures do not include private cars of commercial firms or corporations.

The average number of locomotives per 1,000 miles of line was 243 and the average number of cars per 1,000 miles of line was 9,350. The number of passenger-miles per passenger locomotive was 2,163,140, showing an increase of 108,510 passenger-miles as compared with the previous year. The number of ton-miles per freight locomotive was 7,375,585, showing an increase of 143,022 ton-miles.

EMPLOYEES.

The number of persons reported as on the pay-rolls of the railways in the United States on June 30, 1907, was 1,672,074, which is equivalent to an average of 735 employees per 100 miles of line. As compared with the year 1906, these figures show an increase of 150,719 in the number of employees, or 51 per 100 miles of line. The total number of railway employees, disregarding a small number not assigned, were apportioned among the four general divisions of railway employment as follows: For general administration, 64,808; for maintenance of way and structures, 538,003; for maintenance of equipment, 352,181, and for conducting transportation, 713,465.

The total amount of wages and salaries reported as paid to employees during the year ending June 30, 1907, was $1,072,386,427.

PUBLIC SERVICE OF RAILWAYS.

The report shows that the number of passengers carried by the railways during the year ending June 30, 1907, was 873,905,133, this item being 75,959,017 more than for the year ending June 30, 1906. The passenger-mileage, or the number of passengers carried 1 mile, was 27,718,554,030, the increase being 2,551,313,199 passenger-miles.

The number of tons of freight shown as carried (in-

cluding fre... received from connections) was 1,796,-336,659, wh... exceeds the tonnage of the year 1906 by 164,962,4... tons. The ton-mileage, or the number of tons carried... mile, was 236,601,390,103, the increase being 20,7...8,862 ton-miles. The number of tons carried 1 m... per mile of line was 1,052,119, indicating an increase ... 69,718 ton-miles per mile of line in the density of f...ht traffic.

The aver... revenue per passenger per mile for the year ending ...ne 30, 1907, was 2.014 cents. For the preceding y... the average was 2.003 cents. The average revenue ... per ton per mile was 0.759 cent; the like average for ... year 1906 was 0.748 cent. The earnings per train mi... show an increase for both passenger and freight trai... The ratio of operating expenses to earnings for th... year 1907 was 67.53 per cent. For 1906 this ratio w... 66.08%.

EARNINGS AND EXPENSES.

The gross earnings of the railways in the United States from the operation of 227,454.83 miles of line were, for the year ending June 30, 1907, $2,589,105,578, being $263,3...411 greater than for the year 1906. Their operating expenses were $1,748,515,814, or $211,638,543 more than in 1906. Passenger revenue was $564,606,-243—increase, $54,573,760; freight revenue, $1,823,651,-998—increase, $183,265,343. Gross earnings from operation per mile of line averaged $11,383, the corresponding average for the year 1906 being $923 less.

The operating expenses were: For maintenance-of-way and structures, $343,544,907; maintenance of equipment, $398,061,728; conducting transportation, $970,952,924; general expenses, $65,404,655; undistributed, $551,600. Operating expenses averaged $7,687 per mile of line, this average showing an increase of $775 per mile in comparison with the year 1906.

The income from operation, or the net earnings of the railways, amounted to $840,589,764. This amount exceeds the corresponding one for the previous year by $51,701,868. The net earnings per mile of line for 1907 averaged $3,696; for 1906, $3,548, and for 1905, $3,189.

The amount of dividends declared during the year under review was $208,137,924, leaving as a surplus from the operations of the year ending June 30, 1907, $141,-323,264.

RAILWAY ACCIDENTS.

The total number of casualties to persons on the railways for the year ending June 30, 1907, was 122,855, of which 11,839 represented the number of persons killed and 111,016 the number injured. Casualties occurred among three general classes of railway employees, as follows: Trainmen, 2,537 killed and 40,755 injured; switch tenders, crossing tenders, and watchmen, 169 killed, 1,091 injured; other employees, 1,828 killed, 45,-708 injured.

The number of passengers killed in the course of the year 1907 was 610 and the number injured 13,041. During the previous year 359 passengers were killed and 10,764 injured. There were 376 passengers killed and 8,113 injured because of collisions and derailments. The total number of persons other than employees and passengers killed was 6,695; injured, 10,331. These figures include the casualties to persons trespassing, of whom 5,612 were killed and 5,512 were injured. The ratios of casualties indicate that 1 employee in every 369 was killed and 1 employee in every 19 was injured. With regard to trainmen—that is, enginemen, firemen, conductors, and other trainmen—it appears that 1 trainman was killed for every 125 employed and 1 was injured for every 8 employed.

In 1907, 1 passenger was killed for every 1,432,631 carried, and 1 injured for every 67,012 carried. For 1906 the figures show that 2,222,691 passengers were carried for 1 killed, and 74,131 passengers were carried for 1 injured. With respect to the number of miles traveled, the figures for 1907 show that 45,440,253 passenger-miles were accomplished for each passenger killed, and 2,125,493 passenger-miles for each passenger injured. For 1906 the figures were 70,103,735 passenger-miles for each passenger killed, and 2,338,-964 passenger-miles for each passenger injured.

THE NEW STREET RAILWAY COMMISSION IN THE DISTRICT OF COLUMBIA.

The regulation of the street railways of the District of Columbia until recently has been entirely under the control of the city government, which, from lack of specific authority, funds and personnel, was not able to exercise more than a routine supervision. The necessity for a more adequate administration of street railway affairs in the District led, in the last session of Congress, to much discussion which finally resulted in a dead-lock between the House and the Senate that held up much needed new-trackage legislation until the very close of the session, when a compromise bill was finally passed. In this dead-lock the House demanded supervision by local authorities, either the District Commissioners or a public service commission, while the Senate held out for control by some judicial body, preferably one entirely dissociated from local influences. By granting some concessions in other parts of the bill, the Senate won its point in the regulation features, and the compromise, as passed, placed the supervision and regulation of the street railways in the hands of the U. S. Interstate Commerce Commission.

After the passage of the bill, it was thought by many that railway regulation in the District would be no more stringent than before, because the Interstate Commerce Commission, since the increase of power granted it in 1907, has had small chance to take much time with the affairs of local railways. To the surprise of many, on July 1, 1908, the Commission issued the following order:

This Commission does hereby constitute and create a board to be known as the District Electric Railway Commission, to be composed of three members who shall act as a board of inquiry and investigation into all complaints touching or affecting matters over which the Interstate Commerce Commission has been given jurisdiction by the Act of Congress approved May 23, 1908.

The Interstate Commerce Commission does hereby appoint Brig.-Gen. John M. Wilson, U. S. A., Retired, Chairman, District Commissioner Henry L. West, and Thomas W. Smith, Esq., residents of the District of Columbia, as the members of said District Electric Railway Commission, to serve without salary. Said appointees shall have all of the powers vested in, or which may be exercised by, examiners appointed under, and in accordance with, the Act to regulate commerce, including the power to administer oaths. It shall be the duty of such District Electric Railway Commission to make investigation in the first instance into all matters as to which complaint is made to the Interstate Commerce Commission under the above mentioned Act of May 23, 1908, and to make such recommendations to the last named Commission as to all necessary orders, rules, regulations or requirements which said District Electric Railway Commission may deem proper.

In addition to the above non-salaried commissioners, the Commission appointed Mr. H. C. Eddy, Assoc. Am. Inst. E. E., as a salaried officer with the title of Executive Officer and Secretary. Mr. Eddy has had wide experience in electrical railway work and at the time of this appointment was serving as superintendent of the electrical department of the District of Columbia.

This procedure has caused no little consternation among those who had fought in Congress all action toward creating a local governing board, for the Commission, as at present constituted, differs only in the matter of salaries from the commission advocated by the House committee, whose wishes in the matter were supposedly overruled by the joint action of the two houses. Some opposition to the action of the Interstate Commerce Commission has indeed developed, principally on the ground that gratuitous service to the government is illegal, but to date no formal fight has been made, nor does it seem probable that any will be.

The subcommittee has not settled down to business as yet, but the hearing of complaints is to be started in the near future. As a start toward safer car service, however, the following regulations have recently been issued.

1. Every street railway car operated in the District of Columbia shall be fully equipped with front pick-up fenders of the Blackstone, Claude, Tobe, Preusser or Parmenter patterns, and with wheel guard fenders of the Brightwood automatic, the Blackstone, the Eldridge Smith, the Tobe or the Parmenter improved pattern; provided, that any street railway company may substitute for the above any other fender or wheel guard which may hereafter be approved by the Interstate Commerce Commission.

2. Every street railway car operated in the District of Columbia must be so constructed or altered that a clear space of fifteen inches in height above the rails is provided between the wheel guard and the adjacent end of the car, in order to allow the effective action of the wheel guard.

3. Platforms of street cars shall be guarded by gates of a construction and operation approved by the Interstate Commerce Commission.

4. The fenders must be kept in thorough working order and in good repair when in use.

5. No street car shall move at a greater rate of speed than fifteen miles an hour in the city of Washington, nor at a greater rate of speed than twenty miles an hour in the suburbs of the city. Street cars shall not exceed a rate of speed greater than six miles an hour at street crossings. No motorman or conductor shall refuse to stop to take up a passenger unless all the seats in the car or train are occupied.

6. Whenever street railroads cross each other, all cars or trains bound north or south shall have the right-of-way over trains or cars bound east or west and all motormen shall, on approaching intersecting crossings, stop their cars or trains and see that the way is clear before crossing; provided, that the provisions as to the right-of-way shall not apply where branches of the same street railway cross each other.

7. Flagmen shall be stationed at the crossings of all street car lines when in the judgment of the Interstate Commerce Commission the public safety requires the same. And from and after the direction of the commission to any street railway company to station a flagman at any such crossing, it shall be unlawful for any motorman to run or operate any motor car over such crossing in the absence of a flagman. No street car shall stand upon a street or avenue for a longer period than five minutes unless the way be obstructed, nor stop so as to obstruct a street crossing or intersecting street; and no street car shall follow a preceding car moving in the same direction at a less interval than 100 feet, unless coupled thereto. Every street car in motion after sundown shall have two lights, one displayed at each end thereof.

AN AMERICAN DEGREE CONFERRED BY AN ENGLISH UNIVERSITY.

A unique example of international courtesy is the delegation of the granting of a degree by Lehigh University to the University of Liverpool, the degree being bestowed on Mr. H. F. Parshall, the distinguished electrical engineer.

Lehigh University, in the 41 years of its existence, has conferred only four honorary degrees, the preceding grants being to Dr. Rossiter W. Raymond, of New York, the Secretary of the American Institute of Mining Engineers, Dr. Arthur Arton Hamerschlag, Director of the Carnegie Technical Schools of Pittsburg, and Mr. L. B. Stillwell, the well-known electrical engineer of New York City.

Mr. Parshall is an American and graduated in 1887 from the electrical engineering course of Lehigh University soon after its establishment. After ten years of practice in the United States, Mr. Parshall established himself in Great Britain, and has become one of the foremost engineers in that country in the electrical field.

Among other duties, he holds the position of Chief Electrical Engineer to the London County Council. He is the author of "Armature Windings of Electric Machinery" (1895); "Electric Generators" (1900); "Electric Machine Design" (1906); "Electric Railway Engineering" (1907). He is a member of the Institution of Civil Engineers of Great Britain, of the Institution of Electrical Engineers of Great Britain, of the American Society of Mechanical Engineers and of the American Institute of Electrical Engineers.

Lehigh University voted to confer the honorary degree of Master of Science on Mr. Parshall this spring. Mr. Parshall, however, was engaged as expert in important hearings before Lord Cromer's Parliamentary Commission on the London and District Electricity Supply Bill, so that he was unable to come to America to receive the degree at Lehigh's commencement in June. As the University does not grant degrees *in absentia*, the very original and interesting plan of having the degree conferred in England was arranged between the authorities of Lehigh University and the University of Liverpool, the Alma Mater of Sir William Ramsay, and an institution justly regarded as a leader in scientific education.

The letter of Vice-Chancellor Dale of the University of Liverpool to President Henry S. Drinker of Lehigh University, accepting the duty, contains a most pleasant expression of international good feeling:

The Council and Senate of this University have agreed to act on the suggestions that you make, and to confer formally on Mr. Parshall the honorary degree that has been awarded to him by the University over which you preside. When the hood and diploma have reached us I will then arrange with Mr. Parshall for his formal admission to the degree.

So far as I am aware no precedent or parallel for such

an act can be found in the history of British Universities. But it is our business to make precedents as well as to follow them, and we trust that in so doing our act will be regarded as an expression of fellowship and sympathy with kindred institutions carrying on similar work, established for similar services, and bound to us by many ties.

The degree was conferred on July 2 at a special "congregation" of the University of Liverpool, attended by the United States Consul General and many distinguished guests.

THE WRECK OF THE CAZADERO HYDRO-ELECTRIC POWER PLANT ON THE CLACKMAS RIVER, NEAR PORTLAND, ORE.

On June 21 a most unusual accident happened to the generating machinery at the Cazadero station of the Portland Railway, Light & Power Co., near Portland, Ore. This plant was described in an illustrated article in Engineering News, June 27, 1907.

An attempt was made to secure details of the accident from officials of the power company, but these were refused, pending investigation. However, the matter for the following account was forwarded by a correspondent as authentic although not official.

The three 2,500-KW., 11,000-volt alternators were each direct connected to a 5,000-HP., double-unit, Francis-type turbine. The rated speed was 330 r. p. m. Each unit is controlled by a vertical, Lombard-type governor. For some unknown reason, possibly the breaking of the governor belt or the negligence of the attendant in properly starting the machine, the speed of one unit began to accelerate rapidly. Inasmuch as the safety device for shutting down in case of breakage of the governor belt had been removed, it is impossible to attach any blame to the governor. The attendant attempted to shut down the motor-operated headgates, but this operation takes about one minute on account of provision for avoiding water hammer, and in the meantime the generating unit was still rapidly accelerating.

The centrifugal force in the rotating field of this unit became so great, before the gates could be closed, that it burst. The flying fragments evidently struck and disabled the governor of the adjoining similar unit so that this generating set also ran away until the rotor flew apart. These fragments in turn disabled the third governor, and its generating set also was destroyed similarly.

The missiles from the three generators went through the roof of the building and some even went through the brick walls. The heat liberated in the third generator became great enough to set fire to the insulation which, by being thrown about, set fire to the composition covering of the roof. A small board-section of the floor was also consumed.

The main switchboard near one end of the building was practically uninjured. Two of the Lombard governors are in such condition that they are being repaired, while a third Lombard governor of exactly the same type has been ordered. The twin-turbines of the three units, it is reported, were but little damaged. The damage by the flying fragments was greatest near the vertical planes passed through the arms of the generator fields. As would have been expected, the generators were completely wrecked and the total damage to the plant has been estimated at about $100,000.

The accident happened early in the morning when the load was light. Some of the auxiliary steam plants of the company were immediately started up and no interruption to the service occurred.

It is at once evident that the generators were not designed to withstand the maximum stresses which might have been expected to come upon them. It would have been possible for the designers of the plant to have ascertained the maximum speed which the turbines could have developed with full head, an open blocked governor and no load. Such a maximum velocity of rotation would approach the velocity of the water on entering the rotor and might have been pre-determined from the design of the turbines. Had the manufacturers of the generators been informed of such a possible requirement they could have met it or have indicated the need of a modified turbine design. Had these generators been designed to meet the requirements the rotor of the first would have remained intact until the gates had closed.

Steps were taken at once to secure new generators without waiting the time necessary to build new machines, probably some six months. The company telegraphed in all directions inquiring for generators that could be made to replace the destroyed ones. A generator that had been recently completed by the General Electric Co., at their Schenectady works for the Japanese Government was released by the latter. A second machine was transferred from a substation and the third is being built.

The new machines to replace the temporary installation will be 60-cycle, 24-pole, it is reported, instead of the 33-cycle, 12-pole type replaced. The use of 60-cycle machines will eliminate the frequency changers needed for the lighting circuits. It is reported that the new machines must stand the maximum theoretical speed of the ungoverned turbines for one hour.

After the three damaged units are restored steps will be taken to put in the two additional ones for which the plant was designed, so that the entire development, 25,000 HP. will be completed.

A DYNAMITE EXPLOSION occurred in the store-room on the seventh level in a colliery near Borbeck, Germany, July 15. Eight miners were killed.

A HOISTING ROPE BROKE in a mine at Hawkrun, Clearfield County, Pa., July 17, by which three miners were killed. The rope, while drawing five mine cars up the steep incline of the Acme slope, suddenly snapped and the train dropped back down the slope.

A GAS EXPLOSION IN A MINE at Williamstown, Dauphin County, Pa., July 15, resulted in the death of seven mine-workers. The explosion took place in shaft No. 1 of the Bear Valley mine, and is thought to have been caused by one of the miners lifting the gauze of his safety lamp after a shot. The Bear Valley mine is owned by the Susquehanna Coal Co.

A BOILER EXPLODED at Dighton, Mich., July 14, in the flooring plant owned by Jones & Green, of Big Rapids, Mich. One man was killed. The accident occurred early in the morning before the beginning of the day's run. There were two boilers in the plant, each 54 ins. in diameter and 20 ft. long. Portions of the exploded boiler were found at a distance of 100 rods from the building. Almost the entire plant was wrecked.

THE MEMPHIS EXPRESS on the Missouri Pacific Ry. was wrecked on July 14, between Morgan Ford Road and Kingshighway in St. Louis, Mo. Owing to a misunderstanding of orders, the train collided head-on with a switch engine. The engineer of the express train was killed.

WESTERN MARYLAND EXPRESS NO. 2, running from Elkins, W. Va., to Baltimore, was overturned on a sharp curve near Westenport, Md., July 18. Twelve passengers were injured. The tender truck first left the rails and caused the four cars composing the train to tip over. The locomotive, though partly derailed, remained upright.

AN ELEVATED RAILWAY TRAIN was wrecked in Chicago, July 18. The train of three cars crashed into the bumpers at the terminus of the Jackson Park branch of the South Side Elevated Road with such force that the forward end of the foremost car was thrust out some 10 ft. beyond the end of the elevated structure. The front trucks of this car were torn off and derailed, and the front platform was practically demolished.

A TROLLEY CAR WRECK occurred July 13 in Cleveland, Ohio, on the E. 49th St. bridge over Morgan Run. The conductor and motorman and five others are reported injured. Owing to the failure of the brakes to grip the wheels, the motorman lost control of an E. 55th St. car as it ran onto the bridge. The car was not equipped with air-brakes, as required by city ordinance. Moving at high speed, it struck a worn spot in the rails about 40 ft. from the north end of the bridge, and, being lightly loaded, left the track. It ran on over the pavement to the end of the bridge where it struck a telephone pole, snapping it in two. After breaking the pole, the car was stopped by the iron railing along the edge of the embankment. The running [illegible] was torn off, and the vestibule demolished. Tra[illegible] was blocked for some time before the car could be [illegible] ed on the rails and taken to the barns.

A PECULIAR TROLLEY WRECK oc[illegible] at Johnstown, Pa., July 15. The motorman, to [illegible] a collision, reversed the current, and was then, for [illegible] reason, unable to stop the car from continuing [illegible] backward. It ran back up the track almost a mile, [illegible]ing a high rate of speed, and finally left the r[illegible] a sharp curve at the foot of a down grade. Alt[illegible] there were 100 passengers on board only one was ki[illegible]

AN ELECTRIC EXPRESS TRAIN [illegible] the White Mountains, on the New York, New Ha[illegible] & Hartford R. R., leaving New York City at 8.40 a. [illegible]ly 16, was derailed while passing Greenwich, Conn. [illegible] train was made up of two electric locomotives, a b[illegible]ge car, five parlor cars and three ordinary coache[illegible] the order given. It is reported from witnesses t[illegible] the locomotives, the baggage car and two parlor [illegible] had crossed a small bridge over a street at the ea[illegible] end of the railway station, when the third parlor ca[illegible] the rails. This, it is said, threw the following car[illegible] on the steel and then dragged off the preceding one[illegible] The momentum of the train carried all the cars ov[illegible] the bridge on the ties. The second and fifth parlor ca[illegible] were thrown on their sides. In the last parlor car on[illegible] young woman was thrown through a window and killed. [illegible] This was the only fatality although several persons [illegible] were severely bruised. The cause of the accident is popularly attributed to spreading rails and weak ties. Beginning at the bridge in question there is a slight curve. The speed of the train, according to reports accredited to the railway officials, was about 35 mi. per hr. It is notable that there was no accompanying trouble on the 11,000-volt, alternating-current, overhead system through which the train was furnished power.

FIVE MILES OF TRACK WERE WASHED OUT on the Erie R. R. near Rathbone, Steuben County, N. Y., by cloudbursts, July 12. Traffic was delayed for fifteen hours. One thousand men worked all night making repairs.

A COLLISION took place between two passenger trains on the Texas & Pacific Ry., July 12, 30 miles south of Texarkana, Ark. Eighteen persons were seriously injured. The accident is ascribed to the overlooking of a train order.

ACCIDENT BULLETIN No. 27, issued by the Interstate Commerce Commission, gives the total number of collisions and derailments in the three months ending March 31, as 2,632 (1,190 collisions and 1,442 derailments), of which 199 collisions and 220 derailments affected passenger trains. The damage to cars, engines and roadway by these accidents amounted to $1,977,419.

The total number of casualties to passengers and employees reported in the above-mentioned quarter (15,441) is smaller than in any quarter since that ending with March, 1905; the total number of passengers and employees killed by all causes is smaller than in any quarter since that ending June, 1904; and the total killed in train accidents (125) is smaller than in any quarter since the monthly records were established, July, 1901. The number of employees killed in coupling accidents (44) is smaller than in any quarter since June, 1902. The bulletin states that these gratifying reductions in the list of deaths and injuries are all due primarily to the reduction in volume of traffic on the railways of the country.

THE REBUILDING OF THE QUEBEC BRIDGE is to be undertaken entirely on the responsibility of the Dominion Government, if Parliament passes the bill submitted by the majority report of the committee appointed to investigate the financial side of the original construction and future rebuilding of the bridge. As most of our readers know, the cost of building so immense a structure was too great for private enterprise, especially as the direct financial return would be very small, so the bonds of the company were guaranteed by the Dominion Government to the extent of $6,680,200, in addition to subsidies granted by the province and city of Quebec, respectively, and by the Dominion Government. The bridge company is now bankrupt and the Government therefore now stands liable for these bonds, with assets back of them consisting of the existing partially finished structure at the north side of the river, the approaches, the material in the yards and the land which has been acquired, valued by the majority report at $3,000,000. In regard to the recommendation of this majority report, Canadian dispatches say:

The Government's policy is to place the whole undertaking of the reconstruction of the bridge under the supervision of the Transcontinental Railway Commission, with a view to having the bridge constructed as speedily as possible as a link of the Transcontinental Railway. The commission will entrust the work of drafting plans and the oversight of construction to a board of three of the best engineers available in the world. Among

several names mentioned for this board one is a Canadian, one is an American and one is from Great Britain. The Government's intention is to have the whole undertaking carried out so that there may be no possibility of any mistake, either in the plans or the erection of the new bridge. It is understood that the Government will assume the loss of all the expenditures made by the Quebec Bridge Company under the bond issue guaranteed by the Government up to the time of the collapse of the bridge, amounting to between five and six millions. The Phoenix Bridge Co.'s loss will probably amount to between one and two millions.

It is inferred from this that no further action is to be taken against the Phoenix Bridge Co., but that its loss, noted above, represents the amount not yet paid for material delivered or in process of fabrication at the time of the accident.

A minority report of the committee severely censured the Government for the lax financing and supervision of the entire scheme.

THE TAIL-RACE TUNNEL of the Niagara Falls Power Co., which was inspected on June 14, as noted in our issues of June 11 and 18, has been out of use for several days while small repairs were being made. This is the longest period of disuse since the beginning of operation, 13 years ago. The result of the inspection mentioned showed, it is reported, no sign of material erosion although in two places the tunnel roof had been injured. The damaged spots are adjacent to two ice shafts which were constructed for diverting ice from the intake canal directly into the tunnel extension. The damage is attributed by the power company's engineers to the impact of heavy blocks of ice discharged from the canal through the two shafts. The floor of the tunnel extension beneath each of these shafts is paved with heavy iron blocks that have proved entirely adequate to resist the blows of falling ice. The projection upward of the heavy pieces of ice with buoyant force sufficient to injure the roof structure was not anticipated at the time of the construction of the tunnel extension and ice shafts. In the summer of 1903, however, a substantial buffer of steel beams was placed just above the tunnel roof at the bottom of the ice shaft at the north end of the canal near power house No. 1. Cakes of ice must now strike upon this buffer and be completely shattered before entering the tunnel. The same construction has not been placed in the other ice shaft because, since the winter of 1903-04, it has been found unnecessary to discharge large cakes of ice through that particular shaft, and such use of the shaft is not expected to be necessary in the future. The appearance of the tunnel extension confirmed the judgment of the engineers that the damage was done several years ago, and that the cause no longer exists. The fact that the tunnel extension has been operated continuously for years under its present condition evidently indicates that it might be operated safely for an indefinite period. The company decided to make repairs at once because such repairs will necessitate some reduction in the load of the power plant and because the company's customers are better able at present to allow such a reduction in power than later when an increased demand for their products is expected. It is believed that the full load of the plant can be resumed within a week or ten days from the time work was started (July 21). During its progress the needs of all local customers will be taken care of by the Canadian Niagara Power Co., which will also supply a considerable share of the long distance load. The balance of the long distance load will be carried by the plant of the Electrical Development Co., Ltd., of Ontario. None of the public services, such as lighting and street railway service, will be interfered with in the least. This shut down has forced the International Paper Co. to close its plant while the repairs are being made, as this mill discharges water from its turbines into the main tunnel through a lateral tunnel. While water is shut off from this tunnel, the International Ry. Co. will rebuild the concrete guard wall near the abutment of the upper steel arch bridge. This wall was reported as partially undermined by the discharge from the tunnel.

"THE TALLEST BUILDING IN THE WORLD" is an ever-ready caption nowadays in the composing room of the New York newspaper. Two weeks ago the 909-ft. Equitable tower was scare-headed; now a 1,000-ft. tower on the site of the present Mills Building, Broad St. and Exchange Place, New York, has been discovered by some enterprising reporter. According to press notices this building is now in process of design in the office of Mr. Ernest Flagg, the architect of the 612-ft. Singer tower, but authentic details as to its probable construction are not forthcoming.

THE U. S. BATTLESHIP "SOUTH CAROLINA" was launched July 11 at Cramp's Ship Yard, on the Delaware River. The "South Carolina" has a length between perpendiculars of 450 ft., a breadth of 80 ft., and mean draft of 24 ft. 6 ins. She will have a normal displacement of 16,000 tons and full load displacement of 17,000 tons. The vessel is equipped with reciprocating engines of 17,000 HP., and is expected to develop a speed of at least 18½ knots.

TESTS OF VEHICLE AND IMPLEMENT WOODS have been conducted at Lafayette, Ind., in cooperation with Purdue University, in order to obtain a better knowledge of the mechanical properties of the woods at present used in the manufacture of vehicles and implements and of those which might be substituted for them, as the supply of the hitherto preferred woods is becoming scarce.* Tests were made of buggy spokes with the object of ascertaining the relative toughness of red and white spokes, and to test the correctness of the present system of grading hickory buggy spokes. Three definite results were obtained: red, white or mixed spokes of equal weight have practically the same resilience factor; the strength and toughness of clear spokes varies directly with the weight, the present system of grading buggy spokes does not correspond to their strength and toughness.

Shaft tests were made to determine the relative mechanical properties of hickory shafts graded as XX, which is a third grade, and shafts of red oak, to ascertain the possibilities of the latter in shaft construction. The strength of the oak shafts was found very nearly equal to that of hickory shafts, but at maximum load the former allowed 7½% less deflection. In one quality, the ability to sustain load after failure, the oak could not bear comparison. These tests were, however, not authoritative in results on account of their limited number and the uncertain grading of the wood samples used.

Tests on oak, southern pine and Douglas fir wagon poles showed that the fir poles were superior to the oak poles when not strained beyond the elastic limit. Toughness and ability to resist shock was less in the fir poles than in the oak poles. Trussing of the poles did not appear to be of decided value in any case. On the whole, the value of laboratory tests in solving problems connected with the grading of vehicle wood stock and the substitution of new species for old, was proven. The most useful result of the investigation is the placing of red hickory in a much higher class than former commercial judgment by color has allowed.

MUNICIPAL OWNERSHIP OF WATER-WORKS OF San Francisco has advanced as far as the passage of a resolution, by the Supervisors, declaring the intention of the city to acquire works, and a further resolution, inviting owners of any existing works to offer them for sale. Each of these steps is in accordance with statutory provisions which must be followed before municipal ownership can be established.

A LINCOLN MEMORIAL HIGHWAY, from Washington to Gettysburg, Pa., a distance of 72 miles, has been proposed by Congressman D. F. Lofear of York, Pa., and is said to have received the approval of the Lincoln Memorial Association. The proposition is to make a broad boulevard, 150 ft. in width, with two 50-ft. roadways and an electric railway line and the cost is liberally estimated at $7,000,000 or nearly $100,000 per mile.

A FAN INSTALLATION on the roof of the Hotel Astor in New York City consists of two 66-in., single inlet Sirocco fans running on the same shaft, and direct connected to a 35-HP. motor. The combined capacity of the two fans is 100,000 cu. ft. of air per min., against a ¾-in. water gage. They draw from a common intake chamber of 5 ft. 8½ ins. wide, and exhaust through a brick flue. The distance between the bearings of the shaft is 14 ft.

THE PYKE'S CREEK RESERVOIR DAM in Victoria, Australia, for which bids were recently received, will be something over 100 ft. in height, which will be higher than any earth dam yet built in Victoria. It will have a puddled core wall, with a low concrete wall included in the base of the puddle wall. The work will be carried out by the Department of Victorian Water Supply, of which Mr. Elwood Mead, M. Am. Soc. C. E., is Chief Engineer.

THE COST REPORT ON THE PATHFINDER DAM, as published in the "Reclamation Record" for July, gives data on the quarrying and cutting of 5,567 sq. ft. of face stones consisting of hard coarse-grained granite for use in the dam. The unit labor cost was $0.91 per sq. ft. and the unit supply cost $0.16 per sq. ft., total $1.07. As these face stones are bedded with an average thickness of 3 ft. their total cost per cu. yd. amounts to $9.63. This does not include cost of steel, oil and blacksmith coal, nor plant charges.

TRANSPORTING MECHANICAL FILTER-PLANT tanks by floating was the rather novel method adopted at Newport, England, recently by Mr. R. H. Haynes, M. Inst. C. E., Borough and Water-Works Engineer. This method was used on account of the refusal of a land-owner to permit passage over his land without payment of exorbitant charges for the privilege. The sizes of the tanks are not given, but it appears from illustrations in the London "Surveyor" for July 3, 1908, that they were tanks for pressure filters and were some 8 or 10 ft., more or less, in diameter. Before launching, the fittings were removed, and all the openings closed up by either plugs or flanges. The tanks were then rolled into the water and towed across.

*For complete report see Forest Service Circular 142, U. S. Dept. of Agriculture.

A WATER SOFTENING AND PURIFYING PLANT for the Ensley (Alabama) plant of the Tennessee Coal, Iron & R. R. Co., is one of the improvements in this property undertaken since it came into the hands of the United States Steel Corporation. Wm. B. Scaife & Sons Co., of Pittsburg, have entered into a contract to remodel the old water purifying system for a boiler capacity of 35,000 HP. or 3,360,000 gals. of water per 24 hrs. The system will consist essentially of eight large treating tanks with mechanical stirrers and eight gravity filters.

PERSONALS.

Mr. F. C. Horn, M. Am. Soc. C. E., resigned June 30 as Construction Engineer of the Idaho Division of the Reclamation Service.

Mr. T. H. Brown has been appointed assistant engineer of the Philadelphia division of the Baltimore & Ohio R. R., succeeding G. T. Warren, who has been made a supervisor.

Mr. Fred. B. Hofft, Chief Engineer for W. H. Schott, Chicago, has resigned this position to become Assistant General Manager of the Merchants Heat & Light Co., of Indianapolis, Ind.; the change took effect on July 15.

Mr. Frank Maher, for a number of years at the head of the motive power department of the Toledo, St. Louis & Western R. R., at Delphos, Ohio, has been appointed master mechanic for the Chicago & Alton R. R. at Kansas City.

Mr. Albert C. Wood, M. Am. Soc. M. E., has severed his connection with the Juniata Hydro-Electric Co. as Electrical Engineer. He will continue his practice as a consulting engineer at his present address, 819 Pennsylvania Building, Philadelphia, Pa.

Mr. S. J. Dill, Vice-President and General Manager of the Youngstown & Southern Street Ry. Co., has resigned these positions, and on July 20 will leave Youngstown for Elmira, N. Y., where he becomes General Manager of the Elmira Water, Light & Railroad Co.

Mr. Kenneth Allen, M. Am. Soc. C. E., Division Engineer of the Sewerage Commission of Baltimore, Md., has resigned that position to become Chief Engineer of the Metropolitan Sewerage Commission of New York City. The low-level division, of which Mr. Allen was in charge (in Baltimore), will be combined with the storm-water division, and Mr. Herbert M. Knight will have charge of both divisions.

Mr. J. J. Turner, Second Vice-President of the Pennsylvania Lines West of Pittsburg, will become First Vice-President, succeeding Mr. Joseph Wood, who is to retire on a pension within the next six months. Mr. G. L. Peck will become Second Vice-President, and will be succeeded as General Manager by Mr. R. E. McCarty, at present General Superintendent of the Cincinnati & Muskingum Valley R. R.

Mr. William R. Strickland has accepted a position as Mechanical Engineer for the Detroit plant of the American Radiator Co., having recently returned from Porto Rico, where he was Construction Superintendent for J. G. White & Co., of New York, on the construction of their Comeiro hydro-electric plant. Mr. Strickland graduated in 1898, in civil engineering, from the Massachusetts Institute of Technology. At the outbreak of the Spanish War he was commissioned Assistant Engineer, with the rank of ensign in the United States Navy, and served during the war on the U. S. S. "Bennington."

A number of changes in the Corps of Engineers are prescribed by special order No. 163, dated July 13:

Captain Edward M. Adams will take charge of the Charleston engineering district at Charleston, S. C., relieving Col. Dan. C. Kingman.

Lieut.-Col. Harry F. Hodges, by direction of the President, is relieved from duty as a member of the Light-House Board.

Major Henry Jervey is designated as Acting Quartermaster of Mobile, Ala.

Major Thomas H. Rees, at present in command of the Third Battalion of Engineers, is appointed Chief Engineer Officer of the Department of Lakes, at Chicago, Ill., to relieve Col. William H. Bixby.

Major Herbert Deakyne, in charge of river and harbor works at Philadelphia, Pa., will, in addition, take charge of the Wilmington, Del., engineering district, which is at present under the control of Major Clement A. F. Flagler. Major Flagler will take command of the Third Battalion of Engineers at Fort Leavenworth, Kan.

Lieut.-Col. James C. Sanford is relieved from duty at Philadelphia, Pa., and will take charge of the Newport engineering district, which is temporarily under the control of Major Harry Taylor. The order directing Lieut.-Col. Solomon W. Roessler to relieve Major Taylor at Newport has been revoked.

Obituary.

Charles Webb Howard, President for 30 years of the Spring Valley Water Co., which controls the water supply of San Francisco, died July 17 in San Rafael, Cal.

Henry Sancton, a civil engineer employed for many years by the Quintard Iron Works, New York, died July 18, at the age of 58, from injuries received several weeks ago, when his arm was drawn in between a pair of gear wheels.

Willis Doty, a surveyor for the New York Central R. R., was struck and killed, July 16, by a south-bound train on the viaduct in Park Ave., New York. Mr. Doty was the son of C. E. Doty, Supervisor of the electrical division of the New York Central.

William F. Niedringhaus, founder of the great enamelling plant at Granite City, Ill., died, July 14 from dropsy, at his home in St. Louis, aged 73 years. Mr. Niedringhaus was born in Westphalia, Germany, in 1835. In 1884 he built the first power press for drawing shapes out of sheet steel. He was a leading Methodist and founded churches in St. Louis and Granite City, and the chair of theology in Central Western College at Warrentown, Mo.

Thomas L. Jenkins, civil engineer in the insular service at Manila until January, 1908, died in the Philippines July 9. Mr. Jenkins attended the Naval Academy at Annapolis and was afterward an officer in the Revenue Marine Service. Later he was connected with the United States Coast and Geodetic Survey, from which he was transferred in 1903 to the Insular Bureau at Manila, where he was assigned in 1904 to the command of the nautical school. Upon the dissolution of that school, he was made a civil engineer in the insular service, from which he resigned in January to enter private business in Mindoro Island.

Dennis S. Dockstader, for many years connected with the car department of the Erie R. R., died July 13 in Meadville, Pa., aged 78 years. In 1862, he went to work for the Atlantic & Great Western R. R., and was the builder of the only private car ever owned by that company. In 1867 he became Master Car Builder for the Atlantic & Great Western, and retained this position until the absorption of that line by the Erie System in 1887, when he was made General Foreman of the car department at Kentucky, Ohio. Mr. Dockstader retired from active duty twelve years ago.

Daniel N. Stanton, Contractor, who was identified with the construction work on several railroads in the East, died July 17 at his home in New York City. Mr. Stanton was born in Bartlett, N. H., 81 years ago, and entered the railroad construction business at the age of 16, when the Boston, Concord & Montreal R. R. was being built. He was successively engaged in the construction of sections of the Grand Trunk, the Boston, Hartford & Erie, the Portland & Ogdensburg, the Illinois Southern, the Delaware, Lackawanna & Western, and the Erie R. R. He was at one time President of the Alabama & Chattanooga R. R., and he projected and organized the Canada Atlantic Ry. Mr. Stanton was President of the Security Bank, of Boston. Since 1870 his headquarters have been in New York City.

Charles H. Dale, one of the most prominent men in the rubber manufacturing industry, died, July 18, from heart disease at his summer home in Larchmont, N. Y., after a brief illness. He was 56 years old, and leaves a mother, wife and one daughter. Mr. Dale was president and director of the Peerless Rubber Manufacturing Co.; the Mechanical Rubber Co.; the Morgan & Wright Co., of Detroit; the New York Belting & Packing Co.; the Rubber Goods Manufacturing Co.; the American Commerce Co., and the American Dunlap Tire Co. He was a director in the Century Bank; the Merchants' Exchange National Bank; the G. & J. Tire Co., of Indianapolis; the Hartford Rubber Works, of Hartford, and of several other companies. He was a member of the Union League, New York Yacht, Larchmont Yacht and New York Athletic clubs and the Automobile Club of America.

Aniceto Garcia Menocal, M. Am. Soc. C. E., Civil Engineer, U. S. N., Retired, well known as the Chief Engineer of the Nicaragua Canal Co., died July 20 at his home in New York City. His death was due to hardening of the arteries. Mr. Menocal, the son of a Cuban planter, was born in Havana, Cuba, Sept. 1, 1836. His early education was received in the schools of Havana. At the age of 21, he came to the United States, and graduated, in 1862, in civil engineering from the Rensselaer Polytechnic Institute. The following year he was made Sub-Chief Engineer of the Havana water-works, and he retained this position till 1870, when he became Engineer in the Department of Public Works of New York City. In 1872, he was appointed a Civil Engineer in the U. S. Navy.

In the service of the Government, Mr. Menocal attained great distinction. He was Chief Engineer of all the U. S. Government surveys for establishing the practicability of a ship canal from the Atlantic to the Pacific at Nicaragua and Panama, and, in 1887, as Chief Engineer of the Maritime Canal Co., of Nicaragua, he prepared final plans and estimates for a ship canal through Nicaragua. In 1879, he was sent by President Hayes as a delegate to the Paris Canal Congress, and, for his work there he was decorated as a Chevalier of the Legion of Honor by President Grevy of the French Republic. Mr. Menocal was a member of the commission appointed in 1900 to select a site for the principal naval station in the Philippine Islands, and was also a member of the board which, in 1902, prepared plans and estimates of cost for the naval station at Olongapo, Subig Bay, P. I. In the same year he was directed by the Navy Department to select a site for a coaling station on the coast of Liberia, Africa. His latest work was the preparation of plans for a drainage system for the entire northern portion of Cuba.

Mr. Menocal was a member of several scientific and professional societies. He is survived by his wife, formerly Miss Elvira Martin, of Cuba, whom he married in 1866, and by three sons, one a lawyer in New York, another a civil engineer in the U. S. Navy, and the third a banker at Canton, China.

ENGINEERING SOCIETIES.

COMING MEETINGS.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.
July 24-25. Summer meeting at Niagara Falls, N. Y. Secy., W. M. Mackay, P. O. Box 1818, New York City.

NEW ENGLAND WATER-WORKS ASSOCIATION.
Sept. 23-25. Annual convention at Atlantic City, N. J. Secy., Willard Kent, 715 Tremont Temple, Boston, Mass.

ILLUMINATING ENGINEERING SOCIETY.
Oct. 6-7. Annual convention at Philadelphia, Pa. Secy., Van Rensselaer Lansingh, Engineering Societies Building, 33 W. 39th St., New York City.

AMERICAN ELECTROCHEMICAL SOCIETY.
Oct. 30-31. Fall meeting at New York City. Secy., Dr. J. W. Richards, Bethlehem, Pa.

INTERNATIONAL CONGRESS OF REFRIGERATING INDUSTRIES.—The purpose of this congress, which will be held in Paris, France, Oct. 5-10, is to bring together the leading experts and representatives of the different industries of all countries in which refrigeration is used as an agent for facilitating the preservation and transportation of food products by land or sea. It is believed that such a congress will be likely to stimulate the best thought in the world on the subject of refrigeration, and through such a conference of practical and scientific men it is hoped to improve and perfect the production and application of mechanical refrigeration. It is deemed that as the United States is recognized as the pioneer in this field, this country should not lose the prestige it now enjoys, and therefore American interests should be well represented at the forthcoming international congress.

All papers presented at the congress will be printed in pamphlet or book form and each member or delegate will be entitled to a copy of all publications. Societies or associations which secure membership will be entitled to but one delegate. The topics to be considered are divided into sections as follows:

Section 1. Low Temperatures and Their General Effects. President: Mr. D'Arsonval, Member of the Institut, Professor at the College de France.

Section 2. Refrigerating Appliances. President, Mr. H. Leaute, Member of the Institut, Professor at the Ecole Polytechnique.

Section 3. The Application of Refrigeration to Food. President, Mr. A. Gautier, Member of the Institut, President of the Academie de Medecine.

Section 4. The Application of Refrigeration to Other Industries. President, Mr. E. Tisserand, Member of the Institut, Honorary Director of Agriculture.

Section 5. Application of Refrigeration to Commerce and Transport. President, Mr. Levasseur, Member of the Institut, Director of the College de France.

Section 6. Legislation. President, Mr. J. Cruppi, Deputy, Vice-President of the Chamber of Deputies.

The officers of the American Committee are: Honorary President, Hon. David R. Francis, ex-Secretary of the Interior, St. Louis, Mo.; President, Homer McDaniel, Sheriff St. Market & Storage Co., Cleveland, Ohio; Vice-President, John E. Starr, Refrigerating Engineer, 258 Broadway, New York, N. Y.; Treasurer, John S. Field, President Knickerbocker Ice Co., Chicago, Ill.; Secretary, J. F. Nickerson, Editor Ice and Refrigeration, 315 Dearborn St., Chicago, Ill.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.—The association has begun the publication of a Proceedings which will be issued "at regular intervals in an English, French and German edition" and sent without charge to members of the Association. The first number of this Proceedings, a 6 × 9-in. pamphlet, says in its front-page announcement:

This periodical will contain not only business communications, Congress papers and Congress proceedings, but also notices of the work published by the National Societies and the Laboratories for Testing Materials in the various countries; and further notices of any other prominent publications in this branch.

The first number contains the proceedings of the ing of the Council of the Association on April

The next Congress is to be held in Copenhagen, in September, 1909.

A list of subjects for discussion or for committees has been drawn up by the Council of the Association. The full list with the complete of the committees, is printed in the Association pamphlet of Proceedings. The following is a abstract, giving the chairman and the American members of the committees:

Methods for introducing international specifications for inspecting iron and steel.—A. Rieppel, of Nuremberg, Germany; H. H. Campbell of Steelton, Pa., J. of Philadelphia, Pa., John McLeod, of Pittsburg, Pa., Wm. H. Wahl, of Philadelphia, P. Kreuzpointner, of Altoona, Pa., R. Moldenke, of New York City, R. Webster, of Philadelphia, and Walter Wood, of phia.

Methods of inspection and testing for determining the uniformity of individual shipments of iron and steel, and study of ball pressure tests.—Mr. Ast, of Austria; Booth, Garrett & Blair, of Philadelphia, Pa., T. Gray, of Terre Haute, Ind., G. C. Henning, New York City, P. Kreuzpointner, of Altoona, Pa., A. Stevenson, of Burnham, Pa., W. R. Webster, of Philadelphia, Pa., and A. Sauveur, of Boston, Mass.

Uniform methods of testing cast-iron and cast castings.—R. Moldenke, of New York City; A. E. Outerbridge, Jr., of Philadelphia, Pa., A. Sauveur, of Boston, Mass., and T. D. West, of Sharpsville, Pa.

Principles for specifications for copper.—Leon Guillet, of Paris, France; C. E. Skinner, of East Pittsburg, Pa., H. E. Diller, of Chicago, Ill.

Weathering of building stones and roofing slate and influence of smoke on building stones.—A. Hanisch, of Vienna, Austria; J. F. Kemp, of New York City, and M. Merriman, of New York.

Rapid methods of determining the strength of hydraulic cements.—F. Berger, of Vienna, Austria, W. W. Maclay, of Glens Falls, N. Y., and C. F. McKenna, of New York City.

Methods for testing puzzolanas to determine their value for mortars.—G. Herfeldt, of Ondernach, Germany; A. Lundteigen, of Union City, Mich.

Determination of the simplest method for separation of the finest particles in Portland cement by liquid and air process.—M. Gary, of Gross-Lichterfelde, Germany.

Accelerated tests of the constancy of volume of cements.—Bertram Blount, of London, England; S. B. Newberry, of Sandusky, Mich., and R. W. Lesley, of Philadelphia, Pa.

Investigations of reinforced concrete.—F. Schüle, of Zürich, Switzerland; A. N. Talbot, of Urbana, Ill.

Uniform tests of hydraulic cements by prisms and determination of a standard sand.—F. Schüle, of Zürich, Switzerland; R. L. Humphrey, of St. Louis, Mo.

Uniform nomenclature of iron and steel.—H. M. Howe, of New York City; H. H. Campbell, of Steelton, Pa., and A. Sauveur, of Boston, Mass.

Uniform definition and nomenclature of the bitumens.—Jenö Kovács, Tataros, Hungary; A. W. Dow, Washington, D. C., and Clifford Richardson, New York City.

Methods of testing caoutchouc.—E. Camerman, of Brussels, Belgium; R. G. Pearson, of New York City.

Principles of the specification of oil for technical purposes.—M. Albrecht, of Hamburg, Germany; A. H. Gill, of Boston, Mass.

Questions which will not be handled by special committees are: Methods for testing welds and weldability; The most practical methods of polishing and etching for the microscopic study of iron and steel; Tests with notched bars; Ball pressure tests; The magnetic and electric properties of materials in connection with their mechanical testing; Macroscopic examination of iron; Microscopic examination of iron; Effect of temperature and change in dimension during forging, hammering or rolling, upon the quality of metal; Time of setting of cements and the best method of determining the beginning and duration of setting; The behavior of cements in sea-water; The influence of proportion of water and sand on the strength of cements; Unification of specifications for gypsum; Methods of testing the protective power of paints used on metallic structures.

The following subjects are made primary subjects for this congress: Metals: Metallography, Hardness testing, Impact tests, Alternating stresses, Thermal tests, Tests of cast-iron, Influence of increased temperature on quality. Hydraulic Cements: Reinforced concrete, Progress in methods of testing, Cement in sea-water, Constancy of volume, Tests by prisms and standard sand, Weathering Resistance of Building Stones, Oils, Caoutchouc, Wood, Paints on Metallic Structures. Papers on any of these subjects are invited, but it is requested that they be kept down to eight octavo pages or less, to reduce the expense of printing, which will be in three languages. It is requested that short abstracts be sent with the papers, to simplify their presentation as a basis for discussion.

The secretary of the Association is Mr. E. Reitler, Nordbahnstrasse 50, II 2, Vienna, Austria.

CONSTRUCTION NEWS

Supplement to ENGINEERING NEWS. New York, July 23, 1908.

CONTENTS.

CONSTRUCTION NEWS:
Plans and Specifications on File 29
List of Contracts Pending 29
Railways 29
Electric Railways 30
Light and Power Plants 30
Bridges 31
Buildings 31
Water Supply and Irrigation 32
Sewers 33
Garbage Disposal 33
Streets and Roads 33
Manufacturing Plants 34
Miscellaneous Contracts 34
Contract Prices 35
U. S. Possessions and Cuba 35
CIVIL SERVICE EXAMINATIONS 36
TRADE PUBLICATIONS 36
PROPOSALS 36

CONSTRUCTION NEWS.

PLANS AND SPECIFICATIONS ON FILE.

(denotes that this work is advertised in Engineering News.)*

The following Plans (P.) and Specifications (S.) are on file and may be seen at the office of The Engineering News Publishing Co., 220 Broadway, New York.

Bids close.	Work.	Place.	See issue.
7-24*	Road,	Hackensack, N. J. (S.)	7- 9
7-24*	Sewers,	Philadelphia (P. & S.)	7- 9
7-24*	Bridge,	Hackensack, N. J. (S.)	7-16
7-24*	Bridges,	Philadelphia (P. & S.)	7- 9
7-24*	Sewers,	Lancaster, N. Y. (S.)	7-16
7-25*	Piers,	Charleston, S. C. (S.)	6-25
7-27*	Aqueduct,	Los Angeles, Cal. (S.)	6- 4
7-27*	Waterway,	Wilmington, Del. (S.)	6-25
7-29*	Pumping plant,	New Boston, Ill. (P. & S.)	6-18
7-29*	Bridge equipment,	Chicago, Ill. (S)	7- 9
7-30*	Air compressor,	Pensacola, Fla. (S)	7-23
8- 1	Marine Ry.,	Key West, Fla. (S.)	7- 2
8- 1	Coal-handling plant,	N. Y. (S.)	7- 9
8- 1	Retaining wall, etc.,	Phila. (S.)	7- 9
8- 3*	Bridge,	Benton, Tenn. (P. & S.)	7-16
8- 3	Water pipe,	Fort Wood, N. Y. (P. & S.)	7-16
8- 4	Water system,	Bremerton, Wash. (S.)	7- 9
8-19*	Pumping plant, equipment,	Jerseyville, Ill. (P. & S.)	7-23
8-27	Dam, etc.,	Orland, Cal. (S.)	6-11

LIST OF CONTRACTS PENDING.

LIGHT, HEAT AND POWER PLANTS.

7-23 Heating, electric plant, Wrentham, Mass. 7-23
7-25 Elec. light fixtures, Wash., D. C. 7-23
7-27 Elec. equip., New York 7-16
7-28 Generators, etc., Buffalo, N. Y. 7-23
7-31 Repairing engines, etc., New York. 7-23
8- 1 Power plant, Townsend, Mont.... 6-11
8- 3 Light plant, Hamilton, Ont..... 7-23
8- 5*Lighting, Cranford, N. J..... 7-16

BRIDGES.

7-24*Bridges, Philadelphia, Pa. 7- 9
7-24 Bridge, Hackensack, N. J. 7-16
7-25 Culverts, etc., New Phila., O..... 7- 9
7-25 Bridge work, Houston, Tex..... 7-23
7-27 Bridge, Youngstown, Ohio..... 7-23
7-28 Abutment, Upper Sandusky, O.... 7- 9
7-28*Bridge, Springfield, Ohio..... 7-16
7-29 Bridge, etc., Fort Wayne, Ind.... 7-16
7-29*Bridge equipment, Chicago, Ill.. 7- 9
7-29 Abutments, Jefferson, Ohio..... 7-16
7-31*Bridge, Cincinnati, Ohio 7-16
8- 1 Bridge, Centerville, Pa..... 7-23
8- 3 Bridge, Newton, Kan..... 7-23
8- 3 Bridge, Delphos, Ohio..... 7-16
8- 3*Bridges, Benton, Tenn..... 7-16
8- 3 Bridge, Granite, Okla 7- 2
8- 4 Bridge, Marion, Ind 7-23
8- 5 Culverts, etc., Richfield, Utah.... 7-23
8- 6 Substructures, Eaton, Ohio..... 7-23
8- 8 Bridge, Cleveland, Ohio..... 7-23
8-10 Superstricture, Jefferson, Ohio... 7-23
8-12 Bridge, St. Joseph, Mich..... 7-23
8-13*Substructure, etc., Douglas, Ga.. 7-23
8-22*Bridge, Rocky River, Ohio..... 7-23

BUILDINGS.

7-24 Police stations, New York, N. Y. 7-16
7-24 Roofs, etc., New York, N. Y..... 7-16
7-24 School, Toledo, Ohio 7- 9
7-24*Post-office, Belleville, Ill. 6-18
7-24 Brick plant, Fort Leavenworth, Kan. (mfg. pl.)..... 7-23
7-24 Hotel, Cordele, Ga..... 7-23
7-24*Heating System, Wash., D. C. ... 7-23
7-27 Saw mill, Fort Leavenworth, Kan. (Mfg. Pl.)..... 7-23
7-27 Church, De Kalb, Ill..... 7-23
7-27 Building, West Allis, Wis..... 7-23
7-27 School work, Beatrice, Neb..... 7-23
7-27 Court-house, San Marcos, Tex.... 7-23
7-27 Building, San Diego, Cal..... 7-23
7-27 Jail, Laporte, Ind..... 6-25
7-27 Post-office, Butte, Mont..... 7- 2
7-27 Y. M. C. A. bldg., Richmond, Va. 7-16
7-27 Schools, New York, N. Y..... 7-16
7-27 Heating, etc., New York, N. Y.... 7-16
7-28 City-hall, Augusta, Ga. 7- 9
7-28 School-house, Berwick, Iowa..... 7-23
7-28 Building repair, Fort Mifflin, Pa. 7-23
7-28 Building, Superior, Wis..... 7-23
7-29 Shop, Annapolis, Md. 7-23
7-29*Elevators, Spokane, Wash..... 7- 2
7-29 Boilers, etc., New York, N. Y... 7-16
7-30 Building, New York, N. Y..... 7-16
7-30 School, Burlington, Iowa..... 7-16
7-30*Buildings, Florence, Ariz..... 7- 2
7-30*Mech. plant, Florence, Ariz. (Mfg. Pl.) 7- 2
7-30*Court-house, Portland, Me..... 6-25
7-30 Temple, Missoula, Mont..... 7-23
7-31 School building, New Augusta, Ind 7-23
8- 1 School-house, Sidney, Iowa..... 7-23
8- 1 Plans, St. Paul, Minn. 4-30
8- 1 Plans, Wilkinsburg, Pa..... 7-16
8- 3*Building, etc., Batavia, N. Y.... 7-23
8- 3 School work, Brooklyn, N. Y.... 7-23
8- 4 Remodeling, etc., Oskaloosa, Iowa 7-23
8- 5 Court-house, El Dorado, Kan.... 7-23
8- 6 Quarters, Washington, D. C..... 7-23
8- 6*Dwellings, etc., Riverton, Ala.... 7- 9
8- 8 Plans, Kingston, R. I..... 7-23
8-10*Post-office, etc., San Francisco, Cal 7- 2
8-11*Post-office, Bedford, Ind. 7- 9
8-15 Building, New York, N. Y..... 7-23
8-20 Hospital, Pittsburg, Pa..... 7-23
8-19 Post-office, Petersburg, Va..... 7-16
8-27 Post-office, Logan, Utah..... 7-23
8-31 Post-office extension, Little Rock, Ark..... 7-23
9- 1 School plans, St. Paul, Minn. 7- 9
9- 1 Post-office, Greenville, Ohio..... 7-23
9-22 Laboratory, etc., Ann Arbor, Mich. 7-23
9-23 Court-house, Green Bay, Wis.... 6-18

WATER-WORKS.

7-27*Aqueduct, Los Angeles, Cal. 6- 4
7-27*Pump, Houston, Tex. 6- 4
7-27 Tile, Ottawa, Ill..... 7-23
7-27 Water-works, Sidney, Neb..... 7-23
7-29 Boilers New York, N. Y..... 7-23
7-29*Pumping plant, New Boston, Ill. 6-18
7-29*Fire main extension, etc., Philadelphia, Pa..... 7-16
7-30*Air compressor, Pensacola, Fla. 7-16
7-30 C.-I. pipe, Newark, Ohio..... 7-23
7-31 Water-works, Janesville, Wis.... 7-23
7-31 Pipe line, New York, N. Y..... 7-23
8- 1 Dam, Springfield, Ill..... 7-23
8- 1*Specials, Washington, D. C..... 7-16
8- 3 Water pipe, Ft. Wood, N. Y..... 7-16
8- 3*Filters, etc., Pittsburg, Pa..... 7-23
8- 4 Water system, Bremerton, Wash. 7- 9
8- 5 Filter beds, Pittsburg, Pa..... 7-23
8-12*Pumping engine, Trenton, N. J.. 7-23
8-13*Filter plant, Danville, Pa..... 7-16
8-18 Conduit system, Green Bay, Wis.. 7-23
8-19*Pumping plant, equipment, Jerseyville, Ill. 7-23
8-27 Dam, Orland, Cal. 6-11
9- 1 Water plant, Russelville, Ala. .. 7-23

SEWERS.

7-24 Sewers, Pratt, Kan..... 6-25
7-24 Sewers, Janesville, Wis. 7- 9
7-24 Sewers, Philadelphia, Pa. 7- 9
7-24*Sewers, Lancaster, N. Y..... 7-16
7-24 Sewers, Dayton, Ohio 7-23
7-24 Sewers, Hamler, Ohio 7-23
7-27 Sewer work, Sacramento, Cal.... 7-23
7-27 Sewer extensions, Aberdeen, S. Dak. 7-16
7-28*Sewer, Portsmouth, Va. 6-25
7-28 Sewer system, Fresno, Cal..... 7-23
7-28 Sewer, Virginia, Minn..... 7-23
7-30*Sewer, Woonsocket, R. I..... 7-23
7-30 Sewers, Ft. Wayne, Ind..... 7-23
7-31 Sewers, Rutherford, N. J..... 7-23
7-31*Sewer, Boston, Mass. 7- 9
8- 3 Sewer, Yonkers, N. Y..... 7-16
8- 3*Sewers, Webb City, Mo..... 7-23
8- 3*Sewer, Sayre, Pa..... 7-23
8- 3 Sewer system, Boonville, Ind.... 7-23
8- 5 Sewer, Sheffield, Ala..... 7-23
8- 5 Sewers, Brooklyn, N. Y..... 7-23
8- 8 Sewer system, Toccoa, Ga..... 7-23
9- 1 Sewer, Jackson, Ohio 7-23

STREETS AND ROADS.

7-24 Road, Decatur, Ind..... 7- 2
7-24*Road impvt., Hackensack, N. J.. 7- 9
7-25 Street impvt., Ravenna, Ohio.... 7-23
7-25 Roads, Skillman, N. J..... 7-23
7-25 Road, Waterville, Me..... 7-23
7-25*Grading, etc., Wadsworth, Ohio. 7-16
7-27 Grading, etc., Columbus, Ohio.. 7-16
7-27 Road, Greensburg, Ind..... 7-16
7-27*Curbing, etc., Atlantic City, N. J. 7-23
7-27 Paving, Dayton, Ohio 7-23
7-27 Street impvt., Toledo, Ohio..... 7-23
7-27 Grading, etc., Fort Myer, Va..... 7-23
7-28 Grading, etc., Painesville, Ohio.. 7-23
7-28 Regulating, etc., New York, N. Y. 7-23
7-28 Sidewalks, Shelbyville, Ind..... 7-16
7-30 Street impvt., Pittsburg, Pa..... 7-23
7-31 Sidewalks, New York, N. Y..... 7-23
7-31*Roads, Newton, N. J..... 7-16
8- 1 Street impvt., Fond du Lac, Wis. 7-16
8- 1 Roads, Anderson, Ind..... 7-16
8- 1 Roads, Greencastle, Ind..... 7-16
8- 1*Macadam, Hillsdale, N. J..... 7- 9
8- 3 Grading, etc., Jacksonville, Fla. 7- 9
8- 3 Roads, Tipton, Ind..... 7-16
8- 3 Regulating, etc., Yonkers, N. Y.. 7-16
8- 3 Road, Greensburg, Ind..... 7-23
8-23 Road, Brookville, Ind 7-23
8- 3 Road, Columbus, Ind..... 7-23
8- 3 Street impvts., Lawrence, Kan.. 7-23
8- 4 Road, Martinsville, Ind..... 7-23
8- 4 Road, Vincennes, Ind..... 7-16
8- 4*Grading, etc., Rome, Ga. 7- 9
8- 5 Roads, Bloomington, Ind. 7-16
8- 5 Roads, Muncie, Ind..... 7-16
8- 5 Roads, Frankfort, Ind..... 7-23
8- 6 Stone road, etc., Muncie, Ind... 7-23
8- 6 Roads, Brazil, Ind..... 7-23
8-10*Grading, Van Buren, Ark..... 7-23
8-10*Grading, etc., Verona, N. J..... 7-16
8-12 Grading, etc., Carrollton, Ohio... 7-23
8-14*Roads, Phillipsburg, N. J..... 7-23
8-17 Road, Fowler, Ind..... 7-23

MISCELLANEOUS.

7-23 Dredging, San Francisco, Cal.... 7-23
7-23 Naphtha, New York 7-23
7-24 Ditch, Kankakee, Ill..... 7-23
7-24*Dredging, Boston, Mass..... 7-16
7-25 Ditch, Frankfort, Ind..... 7-16
7-25*Piers, Charleston, S. C. 6-25
7-25 Ditch, Sterling, Ill 7-23
7-27*Waterway, Wilmington, N. C. ... 6-25
7-27 Dynamite, etc., Panama 7-16
7-28*Dike, Harrisburg, Pa..... 7-16
7-28 Ditch, Newcastle, Ind..... 7-16
7-28*Stone, New York, N. Y. 7- 9
7-28*Garbage, New York, N. Y. 7- 9
7-28 Marsh impvt., Leamington, Ont.. 7-23
7-29 Ferry boats, New York 7-23
7-29 Steel pipe line, Valley Stream, N. Y. 7-23
7-29 Ditch, Redwood Falls, Minn..... 7-23
7-30*Canals, ditches, Angleton, Tex.. 7-23
7-30 Trolley tracks, New York 7-23
7-30 Block signals, New York 7-23
7-30 Fences, New York 7-23
7-30 Iron fence, New York 7-23
7-30 Dampproofing, etc., New York.... 7-23
7-30 Platform, New York 7-23
7-31*Dredging, Boston, Mass..... 7-23
7-31 Steam repair, New York 7-23
7-31 Engines, Prince Albert, Sask 7- 9
7-31*Wharf, Fort Mott, N. J. 7- 9
7-31*Dredging, Bangor, Me. 7- 2
7-31 Ry. grading, bridges, Canadian Pacific Ry..... 7-16
7-31 Incinerating plant, Scranton, Pa. (Garbage) 7-16
8- 1*Quay wall, Key West, Fla. 6-25
8- 1*Marine railway, Key West, Fla.. 7- 2
8- 1 Retaining wall, etc., Phila., Pa. 7- 9
8- 1 Coal-handling plant, N. Y. 7- 9
8- 1 Garbage Crem., Bellaire, O. 7-23
8- 3 Ditch, St. Paul, Minn. 7-23
8- 3*Embankment, Greenville, Miss.... 7-23
8- 5 Ditch, Marshalltown, Iowa..... 7-16
8- 6*Breakwater, Ft. Morgan, Ala.... 7-16
8- 6*Pier, shed, San Francisco, Cal.... 7- 2
8- 7 Cableways, Panama 7-16
8-10 Pile dams, New Orleans, La..... 7-23
8-11 Barge canal, Albany, N. Y..... 7-23
8-11*Dredging, Trenton, N. J..... 7-16
8-12*Cement, Chicago, Ill 7-23
8-13*Wooden scow, New York, N. Y.. 7-23
8-14 Light-house, Alaska 5-21
9- 1 Monument designs, Mexico 5-21

FOREIGN.

8-20 Dock construction, Belgium..... 7-16
10- 1 Railway material, Siam 7-16
10-14 Dredging, Spain 7-16
11- 2 Electric plant, Chile 7-16

CIVIL SERVICE.

7-24 Ceramic Chemist, Wash., D. C.. 7-16
7-25 Economic Geology Asst., Albany. 7-16
7-25 Eng. Examiner, Albany, N. Y.... 7-16
7-25 Interpreters, Albany, N. Y. 7-16
7-25 Leveler, Albany, N. Y. 7-16
7-25 Structural Engr., Albany, N. Y.. 7-16
7-29 Asst. Chemist, Wash., D. C. 7-16
8- 3 Ch. Engr., 3d Class—Philippines. 7-23
8- 5 Surv. Mineral Deposits—Wash, D. C. 7-23
8-12 Assistant—Washington, D. C.... 7-23
8- 5 Engr. Wood Preservation—Wash., D. C. 7-23

RAILWAYS.

(denotes that this work is advertised in Engineering News.)*

ALGOMA CENTRAL & HUDSON BAY.—The Dominion Government has granted a subsidy to this company for a line from Michipicoten (Ont.) harbor towards the National Transcontinental main line, not to exceed 50 miles in length. C. N. Coburn is Ch. Engr., Sault Ste Marie, Ont.

ATLANTIC & LAKE SUPERIOR.—Bids will be received until noon, Sept. 9, for the purchase of the Atlantic & Lake Superior Railway, from Caplin to a point at or near Paspebiac, in the County of Bonaventure, Que., where it joins the Atlantic, Quebec & Western Railway, being a total length of 20 miles of railway, and all its rolling stock, equipment and other accessories thereof, including all franchises. Bids will be received by L. A. Audette, Registrar of the Exchequer Court of Canada, at his office at Ottawa, Ont. Bids must be made on printed forms, containing the terms and conditions of the sale, which may be procured on application to Casgrain, Mitchell & Surveyer, Canada Life Bldg., Advocates, Montreal, Que., where all information with respect to the railway may be obtained.

BALTIMORE & OHIO.—Company has awarded to CHARLES A. SIMS & CO., of Philadelphia, the contract for building four miles of single track road in Georgetown, D. C., and to the District of Columbia line. The line will be part of the Washington & Western Maryland road, which the Baltimore & Ohio Co. owns. The charter of the Washington & Western Maryland Co. has been held for some years and, while some work has been done, it was never completed. Congress recently granted an extension of the charter in that part of the District to be traversed, but limited its life to June, 1909, unless the road was built and in operation by that time. It is to comply with this requirement that the contract has been awarded. The work will be done under the direction of D. D. Carrothers, Ch. Engr., and A. M. Kinsman, Engr. of Construction, of the Baltimore & Ohio.

BURK'S FALLS & FRENCH RIVER.—The Dominion Government has granted a subsidy to this company to build a line from Burk's Falls, Ont., to French River, for a distance not to exceed 85 miles.

CANADIAN NORTHERN ONTARIO.—The Dominion Government has granted a subsidy to this company for a line from Sutton Junction to Hatton Mines, Que., for a distance not to exceed 30 miles. D. B. Hanna, Third Vice-Pres., Toronto, Ont.

CANADIAN PACIFIC.—The Dominion Government has granted a subsidy to this company for an extension of the Esquimalt & Nanaimo branch from Cowichan Bay to Cowichan Lake, for a distance not to exceed 24 miles. Noted on July 2. C. E. Cartwright, Ch. Engr., Vancouver, B. C.

CHICAGO, MILWAUKEE & ST. PAUL.—The cost of the Pacific Coast extension of the Chicago, Milwaukee & St. Paul Railroad, which it is expected will be open for traffic on July 1, 1909, will be about $5,000,000 more than the company originally reckoned on, it is said. This additional cost is due to the decision to run the road at a lower grade over the mountain divisions than was at first planned. The total cost of the project is now put at $77,000,000, but, as $100,000,000 of preferred and common stock has been issued to cover the expense of building the extension and to provide a balance for future contingencies there will be no shortage of funds, notwithstanding the increased cost. The Pacific Coast extension of the C., M. & St. P. system was begun about two years ago. It is 1,380 miles long, and continues the road from the former western terminus, in North Dakota, to Seattle and Tacoma, on the Pacific Coast.

CUMBERLAND R. R.—Construction on this railroad will be continued, it is reported, money having been raised by a mortgage on the line already built. The railroad will run from Pineville, Ky., to Jellico, Tenn., 75 miles. S. P. CONDON, of Knoxville, Tenn., has contract. B. L. Milner, Warren, Ky., is Ch. Engr.

EL PASO & KANSAS CITY SHORT LINE.—J. L. Bell, of El Paso, Tex., promoter of the El Paso & Kansas City Short Line R. R., which proposes to build through the Pecos valley, states the line will be extended westward from El Paso, through Mexico, to tidewater, where a good harbor can be secured. It is expected to begin construction about Nov. 1.

LAC SEUL, RAT PORTAGE & KEEWATIN.—The Dominion Government has granted a subsidy to this company for a line from a point at or near Kenora (Rat Portage), Ont., to the National Transcontinental main line, a distance of 18 miles.

LOS ANGELES HARBOR R. R.—A. C. Bird, Pres., Security Bldg., Los Angeles, Cal., advises us that this railroad "has been projected as an auxiliary (belt line) to the Los Angeles Harbor Co. Aside from securing right-of-way for the greater part of the distance, barely little expense or time has been devoted to the railroad proposition, the company giving its chief attention to the harbor work. When this is fully established our work on the railroad will then be taken up, and I cannot give you a clear idea as to when that will be. Probably before the end of the year." As noted on May 14, this line will be 25 miles long, connecting Los Angeles and Wilmington.

MOAPA VALLEY R. R.—Grading is reported under way for the Moapa Valley R. R., which will connect the San Pedro, Los Angeles & Salt Lake R. R. with the Colorado River in Northwestern Arizona. It will open fertile region in the locality where Nevada, Arizona and Utah meet. The first division of the projected road extends from Moapa, Nev., on the main line of the Salt Lake Railroad, down the Moapa Valley southeast to the Virgin River, and another division will extend from that point south to Rioville on the Colorado River. Midway between Moapa and the Virgin River another line is projected to run northeast to Virgin City and the new oil fields of that region. Salt Lake City capitalists are behind the project, which is headed by W. M. O'Brien. In connection with this project a company known as the Rio Virgin Fruit Land Co. proposes to build a dam across the Virgin River at Virgin City for an irrigation project, running three canals out from it and reclaiming a considerable area of arid lands. E. G. Tilton is Ch. Engr. of the S. P., L. A. & S. L. R. R., at Los Angeles, Cal.

NARROWS TERMINAL BELT.—Incorporated with $250,00 capital stock to build a belt line at Tacoma, Wash. The incorporators are Lucian F. Cook, Henry L. Gray, Charles E. Cutter, C. Andrew Tonneson and Fred S. Cook, of Tacoma.

NASHVILLE & LEWISBURG.—This company has applied for a charter with $25,000 capital to build a line form Nashville to Lewisburg, Tenn., about 50 miles, to be operated by either steam or electricity. The incorporators are E. R. Richardson, Edgar Jones, J. R. Thompson, R. J. Lyle and J. R. Shephard, of Nashville.

RAWHIDE WESTERN.—R. E. Tilden, Ch. Engr., Rawhide, Nev., advises us that "this company is a short line of railway to the mining camp of Rawhide. The main line will be 25.2 miles long, and up to date over one-half of the roadbed has been graded. The company expects to have the line graded into town by Sept. 15th. The grading is being done by the REED TEAMING CO., of San Francisco, Cal. The officers of the company are Fred Grutt, Pres.; E. W. King, Vice-Pres.; J. W. Hicks, Secy., and R. E. Tilden, Ch. Engr., all of Rawhide, Nev. The road joins the Southern Pacific Ry. at a point 5¼ miles below Schurz, at the head of Walker Lake." Noted on April 2.

PENNSYLVANIA R. R.—We are officially informed that this company "has just completed and placed in service a new branch line starting one mile south of Ellsworth, Pa., and extending a distance of nearly eight miles to Marianna, a town recently

established by the Pittsburg-Buffalo Co., West Zollarsville, Washington Co., Pa. At Marianna, the Pittsburg-Buffalo Co. has sunk two shafts, and at Sheidler, about a mile farther west, another shaft, all of which are being rapidly connected-up by entries. The inner workings of these mines are projected upon the four-entry system, which is an improved and superior plan for the ventilation and operation of mines where large outputs are required. With the complete equipment of these mines, it is expected that the annual output will be 5,000,000 tons. The Pittsburg-Buffalo Co. is now shipping about 15,000 tons per month of entry coal, but the rooms will not be opened and the mine ready for operation to its largest capacity until next April. The construction of this branch was commenced in the latter part of 1906."

ST. JOSEPH BELT RY.—Application has been made for incorporation by this company, which proposes to acquire, by lease, purchase or otherwise, the railroad of the St. Joseph Stock Yards Co. It is capitalized at $500,000, and the incorporators, all of St. Joseph, are Stephen S. Brown, Joseph L. Fireland, Louis Siemens, Peter P. Welty and Louis R. Sack.

TEXAS & NEW ORLEANS.—Company has amended its charter to build from Gallatin to Rusk, Tex., 17 miles; also from West Port Arthur to Port Arthur, three miles. A. V. Kellogg is Engr. M. W., at Houston, Tex.

WABASH-PITTSBURG TERMINAL.—The receivers for this company and for the West Side Belt have asked authority to issue $954,211 of receivers' certificates for the Wabash-Pittsburg Terminal and $709,720 of receivers' certificates for the West Side Belt. The money to be raised by the sale of these certificates is intended for repairs of tunnels and bridges and for the purchase of new engines. The receivers state that the Wabash-Pittsburg Terminal R. R. Co. is dependent upon the Wheeling & Lake Erie for equipment and that they have been told by the receiver of that road that cars will no longer be furnished. They ask $204,000 for the purchase of twelve new locomotives. The receivers have now four small locomotives and 79 cars, which are suitable only for work trains. For the completion of the tunnels $687,073 is asked and $43,138 for painting bridges. The receivers ask for $630,520 for the reconstruction of bridges on the West Side Belt R. R. and $68,000 for four new locomotives and $2,200 for the painting of steel bridges. Noted fully on June 4.

WASHINGTON & WESTERN MARYLAND.—See Baltimore & Ohio R. R.

ELECTRIC RAILWAYS.

HARTFORD, CONN.—Contracts for the construction of 17½ miles of new railway, at an aggregate expenditure of $1,000,000, will be awarded by The Connecticut Company. The contracts call for the construction of eleven miles of road between Wethersfield and Middletown; 3½ miles from Hartford and Bloomfield, and six miles from Willimantic and South Coventry. Work will commence as soon as the contracts are awarded. J. K. Punderford is Gen. Mgr. Noted last week.

NEW YORK, N. Y.—Bids are asked by J. W. Stevenson, Comr. Bridges, until 2 p. m., July 30, for constructing the outer trolley tracks of the Blackwell's Island bridge over the East River, between the Boroughs of Manhattan and Queens. And also for the construction of block signals for the elevated railway tracks of the Williamsburg (New East River) bridge over the East River, between the Boroughs of Manhattan and Brooklyn.

BUFFALO, N. Y.—The Buffalo Southern Railway Co. has advised the Public Service Commission that plans, surveys and specifications are under way for the completion of the extension in Union St., Ebenezer, along Seneca St. and along the private right-of-way to the town of East Aurora, approximately 20 miles. The matter was presented to the Commission by the citizens of Ebenezer and an order was served on the company in the complaint. The company has promised that construction work will be commenced at once and it hopes to have the extension completed within the current year. It estimates that the cost of construction and equipment will be $500,000. The Commission has announced that if the construction is carried out as promised the cause for complaint will be removed without the necessity of a further order from that body. J. B. Rumsey is Gen. Mgr., 840 Ellicott Sq., Buffalo.

BLOOMSBURG, PA.—Contract has been awarded to LAWRENCE & CO., of Chicago, for the construction of the Bloomsburg & Millville St. Ry., tapping one of the richest agricultural valleys in Pennsylvania. Work will begin at once, and will be completed by Nov. 1. Ten miles of track will be required. The road will be operated by Strang gasoline motor cars. C. W. Miller is Pres., Bloomsburg.

STAUNTON, VA.—City will receive bids until noon, Aug. 4, for a street railway franchise amendment granted to the Blue Ridge Light & Power Co. J. M. Spotts is Pres. of the Company.

ASHEVILLE, N. C.—The Asheville & Carolina Ry. Co., with principal offices in Asheville, chartered on July 1 with a capital stock of $200,000, and authority to construct an electric railway from Asheville to the South Carolina state line, a distance of 35 miles. The incorporators are C. F. White, J. W. Brunson, Jr., F. J. Allison and F. R. Grant, of Asheville; and P. F. Patton, L. W. Walker and J. F. Rowland, of Hendersonville. The newly organized company will take over the franchise of the Asheville & Hendersonville Ry. Co., which owns the right-of-way of the proposed Asheville-Hendersonville electric line, and this right-of-way will be included in the Asheville-South Carolina line. The line has been surveyed and Hendersonville will be included in the proposed route. Actual work on the construction of the road will begin about the middle of August. The same concern has also been granted a charter with a capital stock of $100,000 in the state of South Carolina, with authority to construct an electric railway from Greenville, S. C., to the North Carolina boundary, a distance of 40 miles. The South Carolina section of the road will be known as the Greenville & Carolina Ry., as fully noted on May 14. The two roads will come together at the border line and form one continuous line of electric railway from Greenville, S. C., to Asheville, N. C. The route from Greenville to the state line has not as yet been definitely decided on. The contract for the construction of the proposed road has been let to the CAROLINA CONSTRUCTION CO., of Asheville. The power plant for the road will be located in the Blue Ridge Mountains, about 20 miles from Asheville, and will supply the power for the entire road.

DOTHAN, ALA.—J. R. Keyton has applied for a franchise to build and operate a street railway over the streets of Dothan.

NORWALK, OHIO.—We are officially advised that arrangements for financing the construction of the Cleveland & Indianapolis Interurban Ry., from Norwalk to Bluffton, Ind., are under way with prospects for early completion. C. F. Jackson, of Norwalk and J. Y. Todd, of Toledo, are interested.

INDIANAPOLIS, IND.—The Union Trust Co., of Indianapolis, receiver for the Indianapolis, Newcastle & Toledo Electric Ry. Co., has filed a petition in the Superior Court for permission to issue receiver's certificates for $450,000 for the purpose of completing the construction of the road. The petition is the result of a report of experts employed by the receiver to make an estimate of the cost of completing the roadbed and putting on equipment. The experts calculated that at least $450,000 would be needed. It is understood that the largest creditors of the company have entered into an agreement with the receiver for the completion of the work. Company proposes to build from Indianapolis to Newcastle, 46 miles; Newcastle to Muncie, 20 miles (for which right-of-way has been nearly all secured); Newcastle to Winchester, 28 miles; Newcastle to Richmond, 26 miles, and Shirley to Anderson, 16 miles. Total, 140 miles. The line from Indianapolis to Newcastle and Richmond, 90 miles, is under construction. Power-house will be at Newcastle.

VINCENNES, IND.—We are officially advised that the Vincennes, Centralia & St. Louis Transit Co., recently incorporated to build an electric railway from a point on the east line of the State of Illinois, in Lawrence County, opposite Vincennes, Ind., through the counties of Richland, Clay, Marion, Clinton, Bond, and to a point in St. Clair or Madison Counties opposite the city of St. Louis, Mo., is doing its own construction work. General offices of the company are at 705 Isabella Bldg., Chicago. The incorporators are M. A. Peoples, J. J. Burns, Clyde F. Burns, Dennis O'Connor and J. E. Burns, all of Chicago. Capital stock is $30,000, but it is to be immediately increased. Burns & Co., 705 Isabella Bldg., Chicago, are retained in a consulting capacity for this company and will have entire charge of construction and award all contracts. J. J. Burns is Pres.

EVANSVILLE, IND.—The Norton Interurban Construction Co. has been incorporated to make a specialty of constructing interurban and street railways. J. W. Wilson, W. W. Ackert and Wm. White are directors.

IRONWOOD, MICH.—It is announced that an important extension is projected by the Twin City General Elec. Co., which now operates a line between Ironwood, Mich., and Hurley, on the Wisconsin side of the Montreal River. It is proposed to build from Ironwood to Bessemer. Negotiations for right-of-way are in progress. E. D. Nelson, Ironwood, is Gen. Mgr.

FLINT, MICH.—In accordance with the order of Circuit Judge Wismer, the Detroit, Flint & Saginaw Ry., which has 14 miles of road in operation, was sold recently at public auction. Isaac Applebaum, of Detroit, Pres. and Gen. Mgr., who holds bonds to the amount of $250,000, was awarded the property on his bid of $50,000. The Detroit Trust Co., of Detroit, has been acting as receiver. It is said that Mr. Applebaum will complete the construction of the line to Flint.

PARIS, ILL.—The Paris Traction Co. plans to construct an extension to Chrisman. C. F. Propst is Gen. Mgr.

WARROAD, MINN.—The Northern Minnesota Ry. Co. has been incorporated in Minnesota to build a line connecting Warroad, Roseau, Badger, Pelan and Karlstad. It will be about 60 miles in length. Capital stock, $100,000. Incorporators: George Seeley, Waldron M. J. Jerome and Hector G. Spaulding.

KANSAS CITY, MO.—The Kansas City Southeastern Traction Co. has been incorporated in Missouri. As officially noted on March 26, this company will build a railway from Kansas City, Mo., in a southeasterly direction, passing through the towns of Leeds, Raytown, Little Blue, Lee's Summit, Cockrell and Lone Jack, tapping one of the best farming districts in the state. The road will use gas-electric motive power. Charles A. S. Sims is Pres., 3724 East 27th St.; Howard W. Gibson is Vice-Pres., 2702 Mersington Ave.; B. F. Shouse, Treas., 3724 East 27th St.; C. G. Minturn, Secy., 2714 Mersington Ave.; W. N. Collins, Auditor, 2514 Benton Boulevard; George P. Norton, Gen. Attorney, 1001 New York Life Bldg.; J. C. Herring, Ch. Engr., 2201 Jackson Ave.; C. W. McDaniel, Purchasing Agent, Sixth and Wyandotte Sts., all at Kansas City, Mo.

The Blue Valley Ry. is now in course of construction. It will be a standard-gage electric railway, ten miles long, connecting Kansas City, Leeds and Swope Park. Capital stock, $100,000. Issued, $10,000. Bonds authorized, $100,000. Headquarters, 514 Bryant Bldg., Kansas City, Mo. Officers: Alexander Massey, Kansas City, Mo., Pres.; P. G. Walton, Anthony, Kan., Vice-Pres.; J. S. Chick, Jr., Dwight Bldg., Kansas City, Secy. and Treas.; F. W. Wallenhaupt, Independence, Mo., Elect. Engr.; D. W. Pike, First National Bank Bldg., Kansas City, is Ch. Engr. Noted fully on Nov. 14, 1907.

UVALDE, TEX.—The Uvalde Street Railway Co., capital $50,000, has been chartered by J. C. Kirbey and John B. Smith, of Austin, Tex., and M. M. McFarland, of San Antonio, Tex. Noted on June 25.

ST. LOUIS, MO.—The Missouri Electric Railroad Co. has been chartered to build a street railway to St. Louis, also in St. Louis County and St. Charles County, Mo. Capital, $1,000,000. Robert McCulloch is the principal stockholder. The other stockholders are Bruce Cameron, E. P. Walsh, H. P. Taylor and James Adkins.

EL PASO, TEX.—The Mesilla Valley & El Paso Ry. Co. has been organized in El Paso for the purpose of constructing an electric railway between El Paso and Las Cruces, N. Mex. Capital stock, $1,000,000. It is expected to begin construction soon and to complete the line within one year. It will be 44 miles in length. Among those interested in the project are: Felix Martinez, J. C. Wilmarth, O. H. Baum, H. C. Myles and S. J. Larkin, all of El Paso.

BROWNWOOD, TEX.—A street car franchise has been granted to W. S. Walker, of Granbury, and A. E. Chandler, of Stephenville, Tex. Construction must begin by January 15. Noted last week.

MOUNT PLEASANT, TEX.—H. W. Peterman has been granted a 25-year franchise to build an electric street railway on the principal streets of Mount Pleasant. A line will first be built to Red Springs and Dellwood Park, one mile southeast, to be followed by a belt line around the city. It is proposed to have the line in operation within four months. A company will be organized with a capital stock of $50,000. An application for a charter will be made at once.

SMITHVILLE, TEX.—R. H. Graham announces that he contemplates building about 40 miles of interurban electric railway.

EL RENO, OKLA.—The El Reno Interurban Railway Co. has been chartered with $25,000 capital to build an interurban electric railway from El Reno, via Oklahoma City, to Shawnee, Okla.; also from El Reno to Chickasha; El Reno to Clinton; and El Reno to Enid, Okla.; total length, 250 miles. Directors: James W. Maney, of Oklahoma City; Henry Schafer, Herman K. Schafer, Herman Dittner and Thomas F. Blake, all of El Reno. One mile of track has been laid.

MONCTON, N. B.—The Westmoreland Power Co. will apply to the New Brunswick Legislature for authority to construct and operate electric railways in the city of Moncton and throughout the counties of Westmoreland, Kent and Albert. Provisional directors: C. A. Murray, J. A. Nile, E. A. Smith, G. J. Sproul and R. McManus.

LIGHT AND POWER PLANTS.

(denotes that this work is advertised in Engineering News.)*

CLINTON, MASS.—The contract for the engines for the new power plant of the Bigelow Carpet Co., Clinton, has just been awarded through the office of Chas. T. Main, Engr., Boston, to the PROVIDENCE ENGINEERING WORKS, Providence, R. I. It includes a 400-HP. non-condensing and a 1,000-HP. compound condensing engine, both of the horizontal type. The awarding of the contract for the attached generators has been delayed; the complete units will be of 300 and 750 KW. capacity, respectively. As noted on June 25, the J. W. BISHOP CO., 107 Foster St., Worcester, Mass., has been awarded the contract to build the new power-house for the Bigelow Carpet Co. The building will cost about $140,000, and when equipped as the main power plant for the company's mills, will cost nearly $500,000. We are officially advised that the plans call for brick buildings comprising a power-house 102 × 63 ft.; a boiler-house, 197 × 50 ft.; a coal pocket, 197 × 70 ft., and a pump-house, 48 × 27 ft. The roofs are to be of plank, tar and gravel except that over the power-house, which is to be of concrete and plastic slate. Coal is to be conveyed from the Boston & Maine R. R. tracks by a double track underground tunnel passing under Main St., the latter to be raised to permit of this arrangement. Midway between the coal pocket and boiler-house will be the brick boiler stack 200 ft. high with a 10-ft. flue. The equipment will consist of two electrical units, one of about 750 KW. and the other of about 350 KW. Six 84-in. × 19-ft. boilers are to be added to the eight old boilers of the same size. Two fire pumps, and four feed pumps, complete the power outfit. Pipe tunnels will connect the boiler-house with the dye-house, and the power-house with the weave mill, the former for steam piping and the latter for electric power cables. Charles T. Main, 45 Milk St., Boston, Mass., is Engr.

DANVERS, MASS.—The city has authorized the town treasurer to issue $11,000 of bonds the proceeds to be used for improvements and additions to the municipal electric light plant. E. B. Nichols is Mgr.

WRENTHAM, MASS.—Bids will be received by the Trustees of the Wrentham State School until July 23 for the erection of a service building and two dormitories and for boiler, stack, piping and heating plant and for electric plant, wiring and equipment. Plans and specifications may be seen at the office of Kendall, Taylor & Co., 93 Federal St., Boston, Mass. Albert L. Harwood is Chn. of Trustees.

NEW YORK, N. Y.—Bids are asked by Robert Watchorn, Comr. of Immigration, Ellis Island, N. Y. H., until 2.20 p. m., July 31, for all labor and materials required for repairing the two 100-KW. engines and generators in the power-house on the Main Island, at the U. S. Immigrant Station, Ellis Island, N. Y. H. Particulars as to limitations and conditions governing bidders may be obtained from the Commissioner.

BUFFALO, N. Y.—Bids are asked by Frank B. Steele, Clk. Bd. Supervisors, until 11 a. m., July 28, for a 100-KW. direct-connected generator with 150-HP. engine. The electric generator should be rent, 100 KW. capacity at 1... gas engine and generator should be... best and most serviceable type... gine should be either the ... Rathbun-Jones, Bruce-Meriam ... equivalent. The electric ge... be the General Electric, ... Crocker-Wheeler or its equiva... gine and generator are to be ... pletely installed, ready for ... all necessary material for the complete installation at the ... Armory, Buffalo.

GENEVA, N. Y.—Bids will be received by the City Council for ... city for a term of five years.

MOUNT PLEASANT, PA., WEST PENN ELECTRIC CO., of ... Pa., has been awarded the contract for furnishing the borough with electric light for a period of five years at $70 per arc lamps and $25 per annum for incandescent lamps.

JOHNSTOWN, PA.—The South Cambria Railway Co. has awarded contract for the installation of all the power-house equipment to the GENERAL ELECTRIC CO., of Schenectady, N. Y. ... about $95,000.

PHILADELPHIA, PA.—Henry ... Director Dept. Public Safety, has awarded a contract to the LEEDS & NORTHRUP CO., 4901 Stenton St., Philadelphia, for the installation in City Hall of an electrical testing laboratory for $2,516. Hereafter electrical devices of all kinds and cables and wires will be tested, and the Electrical Bureau will be in a position to reject such electrical supplies as do not come up to standard requirements.

NEW CASTLE, PA.—It has been decided that the proposed electric light plant of the Erie and Ashtabula Division of the Pennsylvania Lines West of Pittsburg probably will be started early next year. The proposed plant will furnish both electric light and power for the entire division, including the yards in this city.

WASHINGTON, D. C.—Date for receiving bids for electric lighting fixtures for the U. S. Senate Office Building has been postponed from July 15 to noon, July 25. Elliott Woods, Supt., U. S. Capitol Building and Grounds.

MARTINSBURG, W. VA.—The Martinsburg Power Co. has awarded contract to WEBSTER M. KEFAUVER, Stafford Hotel, Baltimore, Md., for completion of power plant at Dam No. 4. Mr. Kefauver will be associated with Arthur L. Shreeve, 231 Dolphin St., Baltimore; Shoff & Brubaker, contractors, who were at first awarded this contract have withdrawn. S. N. Myer is Pres. of the Power Co.

AUGUSTA, GA.—J. L. Hankinson and P. Wood are interested in a project to furnish electricity for commercial and industrial purposes in Augusta, also the construction of a power plant and dam about eight miles from Augusta. Preliminary surveys and arrangements are now being made.

LEESBURG, FLA.—Application has been made to the town by Gilbert Hunter, of Jacksonville, for an electric light and water franchise.

COLUMBIA, ALA.—The Columbia Electric Light & Water Co. is planning to develop a water power and extend its transmission lines. D. R. Bragnuier is Mgr.

FRANKFORT, KY.—Bids were received on July 10 by the State Board of Capitol Commission, Frankfort, for erection of power-house for new State Capitol building at Frankfort, and for installation of mechanical equipment. Frank M. Andrews & Co., 25 East Third St., Cincinnati, Ohio, are Archs. Contract was awarded on July 16 to JOSEPH McWILLIAMS & CO., of Louisville, Ky., at $85,521.

LIGONIER, IND.—The City Council has awarded a contract for the construction and equipment of a municipal electric light plant to the C. L. OLDS CONSTRUCTION CO., of Ft. Wayne. City has made an appropriation of $60,000 to pay for the plant.

NORTH CHICAGO, ILL.—Bids were received as follows on July 15 at the Bureau of Navigation, Navy Dept., Washington, for the construction of the heating and electrical distributing mains and concrete tunnel at the Naval Training Station, Great Lakes, North Chicago, Ill.: George M. Painter, Chicago, $136,878; Falkenau Electrical Construction Co., Chicago, $157,750; E. J. Macdonough, Chicago, $129,750; W. H. Schott, Chicago, $123,257; D'Olier Engineering Co., Philadelphia, $163,845; H. D. Hallett, Chicago, $176,770; American District Heating Co., Lockport, N. Y., $136,577.

LINWOOD, KAN.—City has voted to issue $40,000 of bonds for the construction of an electric-light plant and water-works system.

WICHITA, KAN.—Plans have been completed for the construction of a new power plant for Fairmount College, the cost of which is estimated at $5,000.

SIOUX FALLS, S. DAK.—We are officially advised that the State Board of Charities and Corrections of South Dakota has just awarded to the MINNEAPOLIS STEEL & MACHINERY CO., of Minneapolis, Minn., contract for a 16 × 36-in. heavy duty Twin City Corliss engine, to be direct connected to a 160-KW. A. C. generator, to be installed in the State Penitentiary at Sioux Falls.

OKEMAH, OKLA.—The citizens have voted to issue $8,000 of bonds to build an electric-light plant in Okemah.

BREMERTON, WASH.—Bids were received as follows on July 18 by R. C. Holyday, Ch. Bureau of Yards and Docks, Navy Dept., Washington, D. C., for constructing a structural steel frame for the central power station, Building No. 106, U. S. Navy Yard, Puget Sound: International Contract Co.,

737 N. Y. Block, Seattle, Wash., (Item 1) to Champion Iron Co., Kenton, Ohio, $19,[illegible]20; St. Paul Foundry Co., Mackeebin (1) [illegible] Como Ave., St. Paul, Minn., (1) St. [illegible] Minneapolis Steel & Machinery Co., $17,[illegible] Minnehaha Ave., Minneapolis, Minn., 28[illegible] 1) $17,467, (Item 2) $17,467, 3½ (Item [illegible] Des Moines Bridge & Iron Works, mo[illegible] and Tuttle Sts., Des Moines, Iowa, (1) N[illegible] Puget Sound Ship Building Co., $1[illegible] Beach, Wash., (1) $18,984; Puget Ri[illegible] Bridge & Dredging Co., 95 Yesler Se[illegible] Seattle, Wash., (1) $21,940; Brown-W[illegible] Iron Works, 2349 W. Michigan St., K[illegible] polis, Ind., (1) $16,760, (2) $16,760, In[illegible] Penn Bridge Co., 312 Bond Bldg., 95[illegible] Washington, D. C., (1) $17,835, (2) $17,835, five months.

Bids will be received until July 28 at the office of Supplies and Accounts, Washington, D. C., for furnishing supplies at the navy yard, Puget Sound, Wash., as follows: Schedule 48—Miscellaneous electrical supplies. Schedule 50—2,600 incandescent lamps. Applications for proposals should designate the schedule by number. E. B. Rogers is Paymaster General, U. S. N.

SPOKANE, WASH.—The Board of Public Works has adopted a resolution directing the City Engineer to communicate with other cities operating municipal electric light plants with a view of obtaining information in regard to establishing a municipal electric plant in Spokane. The city now pays about $[illegible] per year for lighting service for the city.

SAN FRANCISCO, CAL.—The United Railroads has applied for permission to rebuild its power house at the corner of Beach and Buchanan Sts. The cost of the work is estimated at $63,000. Charles N. Black is Gen. Mgr.

JONQUIERES, QUE.—The AMBURSEN HYDRAULIC CONSTRUCTION CO., of Canada, with offices in Montreal, is building a 32-ft. dam, 132 ft. long, for the Jonquieres Pulp Co., at Jonquieres.

HAMILTON, ONT.—Bids are asked until Aug. 3 by the City of Hamilton, for constructing a plant to light the city with electricity to be supplied by the Hydro-Electric Power Commission of Ontario, Toronto. The system will consist of about 700 arc lamps and complete equipment will be purchased. Cost, $200,000. P. W. Sothman is Consult. Engr., Hydro-electric Power Comn., Toronto.

NELSON, B. C.—Plans are being considered for increasing the equipment of the municipal electric light plant, including the installation of a 100-KW. generating unit. F. A. Smith is Supt. and Ch. Engr.

BRIDGES.

(denotes that this work is advertised in Engineering News.)*

ORISKANY, N. Y.—The contract for constructing a bridge over Oriskany Creek here has been awarded to the CANTON BRIDGE CO., of Albany, N. Y. Paul Schultze is County Engr.

CRESSKILL, N. J.—C. CAMPANINI has been awarded the contract by the County Commissioners, Hackensack, for constructing the stone bridge here at $3,695.

BETHLEHEM, PA.—The Commissioners of Northampton County, at Easton, and of Lehigh County, at Allentown, have approved plans for the construction of the bridge to be constructed across the Monacacy River at Broad St., Bethlehem, and bids for construction will be asked at once and are to be submitted on two sets of plans, one the Luten system, prepared by Prof. Luten, of the National Bridge Co., of Indianapolis, Ind., and the other prepared by R. S. Rathbun, Engr., of the Commissioners of Lehigh County, Allentown. The bridge is to be 455 ft. long, 40-ft. roadway of brick and 10-ft. sidewalks of cement, to consist of five arches, two of 75 ft., two of 90 ft. and one 100 ft. Estimated cost, between $150,000 and $200,000.

BROOKVILLE, PA.—The contracts for constructing two bridges, one over Toby Creek, Snyder Township, and the other over Mahoning Creek, Punxsutawney Borough, have been awarded to PENN BRIDGE CO., at $5,949, and $9,879, respectively, for superstructures. DAVID MELZER and FRANK CLOUSER, at $4.31 and $7.44 per cu. yd., respectively, secured the contract for the substructures.

NEW CASTLE, PA.—At a cost of about $5,000 the county will this summer erect a new bridge over the Big Run at South Jefferson St., to replace the present structure, which is considered dangerous. It will have a width of 50 ft. and will be 66 ft. long.

CENTERVILLE, PA.—Bids are asked by the Council until 2 p. m., Aug. 1, for the construction of one concrete bridge over Two-Mile run in Powell Township. W. H. Farquhar is Clk., West Brownsville, Pa.

BEAVER, PA.—The County Commissioners have awarded contracts to ANDERSON DAVIDSON, of Beaver, for the construction of a bridge with stone abutments and reinforced-concrete body and floors, and to FRANK PARTINGTON, of Beaver Falls, Pa., for the construction of a bridge with concrete abutments and reinforced concrete substructure. The former will span Mill Creek in Greene Township, and the latter Walnut Run in White Township.

DONNOHA, N. C.—The ROANOKE BRIDGE CO., of Roanoke, Va., has been awarded the contract to construct a steel suspension bridge over the Yadkin River, three miles from here.

*DOUGLAS, GA.—Bids are asked by the Augusta Construction Co., at the office of C. B. Hazelhurst, Ch. Engr., Douglas, until noon, Aug. 13, for the construction of the substructure and trestle approaches of a bridge across the Altamaha River, Georgia, on the line of the Georgia & Florida Ry., now under construction between the towns of Hazelhurst and Vidalia, Ga. The work will comprise the founding and building of six concrete piers and about 3,000 ft. of timber trestle approach.

MONTGOMERY, ALA.—This company contemplates the erection of a bridge over the Central of Georgia R. R. tracks, a short distance out of the city. W. H. Ragland is Gen. Mgr.

VICKSBURG, MISS.—The OTTUMWA BRIDGE CO., Ottumwa, Iowa, has been awarded the contract for the construction of several bridges in Franklin County.

EATON, OHIO.—Bids are asked until noon, Aug. 6, by the County Commissioners for the construction of the substructures of certain bridges. C. W. Eidson is County Audr.

JEFFERSON OHIO.—Bids are asked until 1 p. m., Aug. 10, by the County Auditor for the construction of the superstructure of a plate girder bridge over Rock Creek, Rome Township.

YOUNGSTOWN, OHIO.—Bids are asked until July 27 by the Board of County Commissioners for furnishing the material and constructing the substructure and superstructure of a bridge over Mill Creek on the Western Reserve line between Berlin and Goshen Townships.

CLEVELAND, OHIO.—Bids are asked until Aug. 8 by the Board of County Commissioners for constructing a bridge. William F. Black is Clk, Bd.

*ROCKY RIVER, OHIO.—Bids are asked until 11 a. m., Aug. 22, by the Board of County Commissioners of Cuyahoga County, Cleveland, Ohio, for the construction of a concrete bridge over Rocky River, between Lakewood and this city. William F. Black is Clk. Bd.

DELPHI, IND.—Bids are asked until Aug. 3 by the city for constructing a bridge here. W. H. Bradshaw is City Engr.

MARION, IND.—Bids are asked by the Commissioners of Grant County until 2 p. m., Aug. 4, for the construction of a steel bridge, 160-ft. span, with reinforced concrete floor.

ST. JOSEPH, MICH.—Bids are asked until 2 p. m., Aug. 12, by Harry L. Murphy, City Clk., for the construction of a swing-bridge and approaches on State St., over the St. Joseph River. Length, 780 ft. H. G. Ensley is Chn. Bridge Com.

CHIPPEWA FALLS, WIS.—The Board of Public Works on July 6 let the contract for the construction of the Bridgewater Ave. bridge to the WISCONSIN BRIDGE & IRON CO., of Milwaukee, Wis., at $3,285. The bid for the corresponding bridge was $4,242 by A. Y. Bayne & Co. The Wisconsin Bridge & Iron Co.'s bids were as follows: Plan A, $2,995; Plan B, $3,285; Plan C, $2,760; Plan D, $3,150. The bids of A. Y. Bayne & Co. were: Plan A, $4,242; Plan B, $4,000.

NEWTON, KAN.—Bids are asked until 2 p. m., Aug. 3, by B. O. Hagen, County Clk., for constructing a bridge in Emma Township.

LEAVENWORTH, KAN.—H. C. Perkins, Consulting Engr., is preparing plans for the construction of 15 small bridges and culverts for the County. J. W. Niehouse is County Clk.

MITCHELL, S. DAK.—FRED BJODSTRUP has been awarded the contract at $4,963, for constructing five bridges for the county.

YANKTON, S. DAK.—The contract for constructing a concrete bridge at Douglas Ave. was let on July 6 by the city to JOHN E. QUACKENBUSH, of Webster City, Iowa, at $3,295.

MISSOULA, MONT.—The construction of a bridge over the Missoula River is contemplated by the City Council. Estimated cost, $10,000.

SAN ANTONIO, TEX.—Bids are asked until July 25 by the Committee on Streets and Bridges, A. T. Lockwood, Chn., for lowering the Houston St. bridge. J. E. Van Riper is Asst. City Engr.

WEATHERFORD, TEX.—The city has voted $7,000 of bonds to rebuild the bridge on Main St., and for the construction of two new bridges.

CHICKASHA, OKLA.—The County will construct 19 steel and concrete bridges, principally over the Washita River. Specifications have been furnished by E. E. Colby, City Engr.

SACRAMENTO, CAL.—DARBEY LAYDON, 219 Steuart St., San Francisco, has been awarded the contract by the Board of Supervisors for the bridge over the American River at Mormon Island, to be constructed for Sacramento and El Dorado Counties, at $20,995. List of bidders noted on July 9.

RICHFIELD, UTAH.—Bids are asked by the State Board of Land Commissioners, City and County Bldg., Salt Lake City, until 2 p. m., Aug. 5, for the construction of 26 concrete culverts for passing the natural drainage water under the Piute Canal, and for the abutments of ten bridges to carry traffic over said canal. The culverts range in size from an opening of 4 sq. ft. to an opening of 25 sq. ft., and occur at intervals along the canal line beginning at a point two miles north of here, and extending to a point west of Redmond, a distance of 20 miles. The total quantity of concrete required for these culverts and bridge abutments is approximately 1,000 cu. yds. Thos. C. Callister is Secy. Bd.

BUILDINGS.

(denotes that this work is advertised in Engineering News.)*

AUBURN, ME.—Bids were received as follows on July 20 at the office of the Supervising Architect of the Treasury, Washington, for the construction of a post-office here: W. H. Fissell & Co., 1133 Broadway, New York, $53,472; Ambrose B. Stannard, St. James Bldg., New York, $54,672; John A. Greenleaf & Son, Auburn, $61,629; Conners Bros. Co., Lowell, Mass., $54,900; Chas. H. Belledeu, 35 Wareham St., Boston, Mass., $49,815; Woodbury & Leighton, 136 Devonshire St., Boston, $49,937.

AUGUSTA, ME.—Bids were received as follows on July 16 at the office of the Supervising Architect of the Treasury, Washington, D. C., for the construction of a post-office building at Augusta: Horace Purrinton & Co., Waterville, Me., $169,590; Ruel J. Noyes, Augusta, partial bid, informal; W. H. Fissell & Co., 1133 Broadway, New York, N. Y., $144,383.

ROCKLAND, MASS.—The Committee chosen by the town to build the High School on July 11, awarded the contract to the MEAD MASON CO., 550 Tremont Bldg., Boston, at about $51,000.

FALL RIVER, MASS.—The City Property Committe on July 7 voted that the general contract for the erection of the new municipal building at the corner of William and Sixth Sts. be awarded to JOHN B. SULLIVAN & SON, the lowest bidders, at $231,700. S. C. Hunt is Arch.

MEDFORD, MASS.—Plans for a 12-room school to be built here at a cost of $100,000 are being prepared by C. B. Dunham, 6 Beacon St., Boston.

KINGSTON, R. I.—Competitive plans will be received from architects in Rhode Island until 12 noon, Aug. 8, for a dormitory, etc., for the Rhode Island College of Agriculture and Mechanical Arts. Copies of conditions and requirements will be sent to architects making application to Hoard Edwards, Pres.; Chas. Dean Kimball, Chn. Com.

WILLIMANTIC, CONN.—The contract for the construction of the new State Normal School has been awarded by the State Board of Education to C. M. WILLIAMS, of Norwich, Conn., at $45,564. The original bid was $41,194, but the Board decided to have stone, instead of concrete trimmings, which resulted in the additional price. There were several other bidders.

HARTFORD, CONN.—The State Library and Supreme Court Building Commission, Hon. Morgan G. Bulkeley, of Hartford, Chn., and L. W. Robinson, New Haven, Secy., has accepted the plans of Donn Barber, 24 East 23d St., New York, and E. T. Hapgood, Hartford, Associate Archs., for the proposed building, which is to cost approximately $1,000,000. The architects have been instructed to prepare notices to be sent to contractors and builders.

BUFFALO, N. Y.—Edward H. Greiner, 548 Ellicott Sq., representing the Greiner Estate, will build a 5-story and basement brick business block, 50 × 200 ft., on Main St., extending through to Washington St., north of Chippewa St. Bethune, Bethune & Fuchs, 215 Franklin St., are Archs.

CORNING, N. Y.—The town has voted to build a brick school house, two stories high, and estimated to cost $50,000, in School District No. 13.

BATAVIA, N. Y.—Bids are asked until 4 p. m., Aug. 3, by F. Park Lewis, M. D., Pres. Bd. of Trustees, New York State School for the Blind, Batavia, for main building, changes to electric light wiring and fixtures and installing new steel ceilings at the New York State School for the Blind, Batavia.

BROOKLYN, N. Y.—The following bids were received on July 20 by the Department of Education for the installation of electric light wiring, fixtures and fire signal systems in Public School No. 43, Brooklyn: Reis & O'Donovan, 1123 Broadway, $6,839; E. J. Duggan, 1133 Broadway, $7,223; Griffin & Co., 150 Nassau St., $7,486; Commercial Construction Co., 114 East 28th St., $7,788; T. Fredk. Jackson, 592 Columbus Ave., $7,300.

BROOKLYN, N. Y.—F. J. Berlenbach, Arch., has awarded the general contract to the JOHN H. PARKER CO. for the construction of a church for the Church of the Assumption, Rev. Dr. William L. Donaldson, Pastor.

BROOKLYN, N. Y.—Bids are asked by C. B. J. Snyder, Supt. School Bldgs., until 11 a. m., Aug. 3, for repairs to heating and ventilating apparatus of Public Schools Nos. 2, 20, 21, 31, 40, 77, 136 and Erasmus Hall High School and Commercial High School, Borough of Brooklyn; for fire protection, etc., at Public School No. 16, Wilson St., near Bedford Ave., and Public School No. 35 (N. B.), Decatur St., near Lewis Ave., Borough of Brooklyn; for fire protection, etc., at Public Schools Nos. 26, 34, 44, 45, 46, 49, 51, 53, 71, 73, 74, 79, 82, 83 and 86, Borough of Brooklyn; for furnishing a pipe organ, etc., at Erasmus Hall High School, Flatbush Ave., near Church Ave., Borough of Brooklyn.

NEW YORK, N. Y.—The Sun Construction Co., 1400 Fifth Ave., New York, filed plans on July 14 for the construction of two 6-story brick apartment houses to be built on a plot 100 × 85.11 ft. on the north side of 113th St., 125 ft. east of Broadway, Benjamin W. Levitan, 20 West 31st St., New York, is Arch. Total cost, $200,000.

The Belnord Realty Co. will have a 12-story apartment house erected on the block bounded by Broadway and Amsterdam Ave., 86th and 87th Sts. Plans have been prepared by Hiss & Weekes, Archs., 1123 Broadway.

Plans have been filed for a 10-story building to be erected by the New York Press Club, John A. Hennessy, Pres., at the northwest corner of Spruce and William Sts. The structure is to have an ornate facade of brick and ornamental terra cotta, with tall central bays. The ground floor will be devoted to stores and the second to the club offices. There will be a lounging room on the third floor, a billiard room on the fourth floor, assembly rooms on the sixth floor, and the dining room and reception parlor on the top floor. Estimated cost, $100,000. Ernest Greene, is Arch., 5 Beekman St.

NEW YORK, N. Y.—Sommerfeld & Steckler, Archs., 19 Union Square, have prepared plans for a high-class elevator apartment house to be erected by the Crystal Realty & Construction Co. on a plot 100 ft. by 100 ft., at Broadway and 161st St. The facades will be of limestone and terra cotta. Will have 37 rooms on a floor. Estimated cost, $150,000.

Plans have been filed for a 9-story building to be erected by Arthur Tooth on the corner plot at 580 Fifth Ave. Estimated cost, $100,000. Henry Otis Chapman is Arch., 334 54th Ave.

Bids are asked until Aug. 15 by Moore & Landsiedel, Archs., 148th St. and Third Ave., for a 5-story brick and stone apartment building, 53.2 × 90 ft., for Donald Robertson, 256 West 108th St. Cost, $60,000.

We are advised by Moore & Landsiedel, Archs., 148th St. and Third Ave., that they will receive estimates about Aug. 1 for constructing two 4-story apartment houses, 37.6 x95 ft. The buildings will be constructed of brick and stone and will cost $60,000.

The same architects advise us that Isaac Broom will receive estimates about Aug. 1 for constructing three 5-story apartment houses to cost $120,000 and to measure 40 × 91 ft. They will be built of brick, stone and terra cotta. The contract for stone masonry has been let to G. DEL GAUDIO, 1548 St. Lawrence Ave., the Bronx.

NEW YORK, N. Y.—Marshall & Fox, Archs., have awarded the general contract to J. McKEEFREY for the construction of a 3-story theatre for Maxine Elliott and Sam & Lee Shubert. Cost, $300,000.

NEW YORK, N. Y.—Dampproofing elevator machinery, etc. See Miscellaneous Contracts.

BUFFALO, N. Y.—The Enos & Sanderson Co., hardware dealers, 43 Carroll St., will erect a 2-story and basement warehouse, 105 × 200 ft., of brick and structural steel at Swan and Center Sts. Colson & Hudson, 35 Dun Bldg., are Archs.

TROY, N. Y.—We are officially advised that the contract for the erection of three new buildings for the Emma Willard School has been awarded by the Trustees to the CHARLES P. ROLAND CO., 208 Times Bldg., Troy, the lowest bidder. M. F. Cummings & Son are Archs.

TROY, N. Y.—THE HUDSON VALLEY CONSTRUCTION CO., of Troy, has been awarded the contract for the construction of the Sage Memorial building in connection with the Emma Willard School here. The contract price is $531,000.

PATERSON, N. J.—We are officially advised that the FRANK E. GILBRETH CO. 34 West 28th St., New York, has been awarded the contract for the construction of a cotton mill at Paterson, N. J., for Harry E. Danner. F. W. Dean, Boston, is Engr.

HOBOKEN, N. J.—The Public Service Corporation is taking estimates for a terminal shed to be built at Ferry St. and the Delaware, Lackawanna & Western station. The structure will cost $300,000. Thomas N. McCarter is Pres. Public Service Corporation; Martin Schreiber is Supt. of Construction, 7 Central Ave., Newark, N. J.

PRINCETON, N. J.—Frank Miles Day & Bro., Archs., 925 Chestnut St., Philadelphia, Pa., will prepare plans for a 3-story dormitory building for the University of Princeton, Princeton. The building will cost $250,000.

PITTSBURG, PA.—Bids are asked until 3 p. m., Aug. 20, by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction (except elevators) of the U. S. Marine Hospital at Pittsburg.

PHILADELPHIA, PA.—Bids were received as follows on July 20 by Col. F. C. Denny, Quartermaster, Marine Corps, U. S. A., Washington, D. C., for an addition to the Marine Corps building, Philadelphia: (a) building complete, according to specifications; (b) same, with monolithic reinforcement; (c) same, with "mushroom" reinforcement: Philip Haibach Construction Co., 26th and Thompson St., Philadelphia, (a) $67,292, (b) $68,800, (c) $77,100; Lynch Bros. Co., Lippincott Bldg., Philadelphia, (a) $63,239, (b) $64,000, (c) $72,000; B. Ketcham's Sons, Philadelphia, (a) $69,831, (b) $71,881, (c) $77,463; William Steele Sons Co., 1000 Arch St., Philadelphia, (a) $59,900; (b) $63,900, (c) $75,900; Turner Forman Construction Co., Philadelphia, (a) $63,900; Penn Bridge Co., Bond Bldg., Washington, D. C., (a) $58,789; Horace B. Deal Co., Heed Bldg., Philadelphia, (a) $65,797, (b) $69,597, (c) $76,297; P. J. Hurley, 1216 Chancellor St., Philadelphia, (a) $68,191; (b) $70,389, (c) $75,916; James G. Dock, 1420 Chestnut St., Philadelphia, (a) $64,684, (b) $66,500; Griggs & Co., 1328 Chestnut St., Philadelphia, (a) $63,900, (b) $65,300; Charles McCaul Co., Philadelphia, (a) $69,988; Cramp & Co., Philadelphia, (a) $62,246; (b) $64,111, (c) $75,300; J. G. Brown, Witherspoon Bldg., Philadelphia, (a) $72,000, (c) $73,550; William Krug Construction Co., German-American Bldg., Philadelphia, (a) $68,111, (b) $70,111, (c) $80,111; William F. Holding, 2426 Davidson Ave., New York, (a) $69,500, (b) $72,000, (c) $79,000.

FT. MIFFLIN, PA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 a. m., July 28, for repairing buildings at Ft. Mifflin. Applications for proposals should refer to Schedule 66. E. B. Rogers is Paymaster Genl., U. S. N., Washington.

PHILADELPHIA, PA.—Competitive plans by Bailinger & Perrott, Archs., have been chosen for the new building to be erected at the northeast corner of Broad St. and Columbia Ave. for the Philadelphia Turngemeinde on the Baird property, bought by it last spring. The building will be of brick and reinforced concrete, three stories high and will cost $150,000.

WILKES-BARRE, PA.—The St. Nicholas German Catholic Congregation, Rev. Monsignor Nagel, Rector, will erect a parochial school building, to cost about $50,000. George Gable is a member of Bldg. Com.

DUNMORE (Scranton post-office), PA.—John A. Duckworth, Coal Exchange, Scranton, is preparing plans for a high school to be built at Dunmore at a cost of $50,000.

PITTSBURG, PA.—Contracts for the erection of 90 double frame houses for the accommodation of 180 families were awarded on July 13 by the H. C. Frick Coke Co. to the NICOLA BLDG. CO., Farmers Bank Bldg., Pittsburg. This is part of the work outlined by the coke company in connection with the plant being built in Fayette County, near the Monongahela River. According to the terms under which the contract was placed, construction will be started at once and the buildings will be completed some time this fall.

ANNAPOLIS, MD.—Bids will be received at the Navy Department, Washington, D. C., until July 29 for shop building at the United States Naval Academy, Annapolis. Blank forms of proposals and specifications will be furnished and plans may be seen on application at the United States Naval Academy, Annapolis, or of Ernest Flagg, Arch., 35 Wall St., New York. Set of drawings may be obtained at architect's office by depositing $10. J. E. Pillsbury is Acting Secy.

BALTIMORE, MD.—H. Clay Waldman, Jr., American Bldg., Baltimore, has awarded the contract to the AMERICAN CONTRACTING CO., American Bldg., Baltimore, to design and erect ten dwellings on Robert Ave., ordinary construction, 16 × 64 ft., steam heat, electric lighting. Cost, $50,000.

WASHINGTON, D. C.—Bids are asked until noon, Aug. 6, by Capt. H. L. Pettus, Q. M., Walter Reed Army General Hospital, Takoma, for the construction of one double set of hospital Corps Sergeants' quarters at the Walter Reed Army General Hospital, Washington, D. C., including plumbing, gas-piping, electric wiring and electric lighting fixtures.

WASHINGTON, D. C.—We are officially advised that the Auditorium Amusement Co., recently incorporated with $500,000 capital stock, will erect a 4-story fireproof theater 93.8 × 144 ft., on H St. Seating capacity, 3,000. Estimated cost, $250,000. Samuel Ross, 614-622 Eleventh St. N. W., is Pres.; E. K. Fox, 14th St., at New York Ave., Treas.; W. F. Thomas, Munsey Bldg., Secy. W. H. McElfatrick, 1402 Broadway, New York, is Arch.

Bids will be received at the general depot of the Quartermaster's Department, Washington, D. C., by Major M. Gray Zalinski, Q. M., U. S. A., until Aug. 5 for constructing a brick addition, etc., at Seven Pines National Cemetery. Plans and specifications may be obtained from the above office.

*WASHINGTON, D. C.—Bids are asked until 2 p m., July 24, by the Department of the Interior, for the installation of improvements in the heating system of the Interior Department (Patent Office) building, Washington. Copies of the specifications and drawings may be obtained upon application to the Chief Clerk of this Department. Frank Pierce is Acting Secy.

BLUEFIELD, W. VA.—D. J. PHIPPS, Newport News, Va., has been awarded the contract for the construction of the U. S. public building here.

VALDOSTA, GA.—Bids were received as follows July 15 at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post-office building at Valdosta, Ga.: Barnes Bros., Hamilton, Ohio, $103,000; Winder Lumber Co., Winder, Ga., $100,989; Gude & Co., Atlanta, Ga., $121,000; Wilworth Bldg. Co., New York, $98,945; King Lumber Co., Charlottesville, Va., $118,000; Miles & Brodt, Atlanta, Ga., $104,400; Joseph Trimby, Chattanooga, Tenn., $107,192; George B. Hinman, Atlanta, Ga., $104,525.

CORDELE, GA.—Bids will be received by Dave Browder until 4 p. m., July 24, for the erection of a 4-story brick hotel. Plans, etc., may be seen at the office of T. W. Smith & Co., Archs., Columbus, Ga.

ATHENS, GA.—The University of Georgia will erect a building for gymnasium and Y. M. C. A. department. Cost, approximately $85,000. David C. Barrow is Chancellor.

JACKSONVILLE, FLA.—We are officially advised that the general contract for the construction of a bank and office building, 52 ft. by 105 ft., ten stories and basement, fireproof construction, for the Atlantic National Bank, Jacksonville, has been awarded to JAMES STEWART & CO., Westinghouse Bldg., Pittsburg, Pa. Estimated cost, $200,000. Estimated cost of equipment, $50,000. Mowbray & Uffinger, 92 Liberty St., New York, are Archs.

TUSCALOOSA, ALA.—C. S. Walin, Chicago, Ill., has submitted the lowest bid for the U. S. post-office at Tuscaloosa, at $125,000.

*MASSILLON, OHIO.—We are officially advised that EMIL CONVERSE, of Massillon, has been awarded the contract by the Board of Public Service for constructing a city hall, 70 × 120 ft., and three stories high. G. G. Paul is Secy. J. M. Bostick is Arch., Canton, Ohio.

ASHTABULA, OHIO.—We are officially advised that preliminary plans have been completed by Briggs & Nelson, Rose Bldg., Cleveland, Ohio, and John Wilson, Ashtabula, Archs., for a 3-story club and gymnasium building for the Y. M. C. A., Ashtabula, to cost $57,000.

GREENVILLE, OHIO.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Deparment, Washington, D. C., until 3 p. m., Sept. 1, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the U. S. post-office here, in accordance with drawings and specifications, copies of which may be had at the office of the Custodian of site at Greenville, or at Washington, at the discretion of the Supervising Architect.

ALLIANCE, OHIO.—Plans have been prepared by Stephens & Pearson, Archs., Missouri-Lincoln Trust Bldg., St. Louis, Mo., for a 3-story theater to be built here for J. D. Collins at a cost of $50,000.

EVANSVILLE, IND.—Bids are asked until July 30 by the Furniture Manufacturers' Building Co., for constructing a 7-story fireproof brick, steel and concrete office building here. The structure will measure 75 × 150 ft. and will cost $100,000. It will contain elevators and power and lighting plant. Harris & Shopbell, 123 Fourth St., Evansville, are Archs.

NEW AUGUSTA, IND.—Bids will be received by H. E. Hill, Trustee Pike Township, until 10 a. m., July 31, for the erection of a school building in District No. 6 in said Township. Plans, etc., may be seen at the office of Henry H. Dupont, Arch., 624 State Life Bldg., Indianapolis, Ind.

ANN ARBOR, MICH.—Bids are asked by the Regents of the University of Michigan, Shirley W. Smith, Secy., until Sept. 22, for the erection of the Chemical Laboratory and for an addition to the Engineering building. Smith, Hinchman & Grylls, 710 Washington Arcade Bldg., Detroit, Mich., are Archs.

DETROIT, MICH.—The Burroughs Adding Machine Co. will erect an office building here. It will have a frontage of 540 ft. on Second Ave., and will be two stories high. Albert Kahn, Union Trust Bldg., Detroit, is Arch.

COLDWATER, MICH.—Bids were received as follows on July 21 at the office of the Supervising Architect of the Treasury, Washington, for the construction of a post-office here: Sherman & Wilmer, Coldwater, $33,742; Charles Heertz & Sons, Grand Rapids, Mich., $37,221; G. A. Richman's Sons Co., Kalamazoo, Mich., $29,700.

DE KALB, ILL.—Bids are asked until July 27 for the construction of a church for the First Methodist Episcopal Congregation. Turnbull & Jones, 131 La Salle St., Chicago, Ill., are Archs.

WEST ALLIS, WIS.—Bids will be received by the Board of Public Works until noon, July 27, for finishing and completing the unfinished rooms in the First Ward school building. J. Phillips, Jr., is Chn. Bd.

SUPERIOR, WIS.—Bids will be received by L. A. Nichols, Secy. Bd. of Education, City Hall, until 2 p. m., July 28, for the erection of a high school building. E. W. Barber, Superior, is Arch.

GREEN BAY, WIS.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Department, Washington, D. C., until 3 p. m., Aug. 18, for the installation of a conduit and wiring system in the U. S. post-office and court-house here.

OSKALOOSA, IOWA.—Bids will be received by L. T. Shangle, Secy. School Bd., until 2 p. m., Aug. 4, for repairing, remodeling, building addition and placing new heating plant in the Second Ward school building. F. W. Glaze is Pres. Bd.

SIDNEY, IOWA.—Bids will be received until noon, Aug. 1, for the erection of a school house in sub-district No. 2, Sidney Township. J. J. Zack is Chn. Comn.

BERWICK, IOWA.—Bids will be received at the residence of W. H. Yoders, one mile west of Berwick, until 2 p. m., July 28, for the erection of a school-house in District No. 2. Plans, etc., may be seen at the residence of Mr. Yoders. Arthur Strain is Secy. School Bd.

*GRAND RAPIDS, MINN.—Bids are asked by Maj. Francis R. Shunk, Corps Engrs., U. S. A., St. Paul, for building helper's dwelling and office building at Pokegama Dam, Mississippi River, near Grand Rapids, Minn.

ST. PAUL, MINN.—Mark Fitzpatrick, Arch., 15 West Ninth St., St. Paul, announces that the contract for the 16-story office building for I. T. Cook, 1607 Chemical Bldg., St. Louis, Mo., will soon be let to the BLACK CONSTRUCTION CO., 2107 Clark St., St. Louis, Mo. Cost, $700,000. It will be built at 5th and Minnesota Sts., of pressed brick and cut stone fireproof construction.

ST. PAUL, MINN.—Buechner & Orth, Archs., Manhattan Block, St. Paul, advises us that estimates will be received in August for a 4-story brick and stone Masonic Temple, 120 × 150 ft. The building will cost $150,000.

HIBBING, MINN.—Radcliffe & Price, Archs., Palladio Bldg., Duluth, have completed plans for a 3-story municipal building for the Village Board, H. R. Weirick, Pres., Hibbing. Cost, $100,000.

LEAVENWORTH, KAN.—Bids are asked by W. P. Feth, Arch., Leavenworth, until Aug. 1 for constructing a 7-story warehouse, 48 × 115 ft., for J. W. Craucer & Co. Cost, $50,000.

EL DORADO, KAN.—Bids are asked by the Board of County Commissioners of Butler County, until noon, Aug. 5, for the erection, construction and completion of a brick and stone court-house and jail. W. H. Clark is County Clk.

BEATRICE, NEB.—Bids will be received by W. W. Duncan, Secy. Bd. of Education, until 8 p. m., July 27, for plumbing, heating and wiring the new high school building.

MISSOULA, MONT.—Bids will be received by the Masonic Temple Association until 10 a. m., July 30, for the erection and completion of a Masonic Temple. Plans, etc., may be seen at the office of J. H. Kennedy, Arch., Missoula, or Kent & Shanley, Archs., Butte, Mont. F. H. Knisley is Secy.

LITTLE ROCK, ARK.—Bids are asked by James Knox Taylor, Superv. Arch., Washington, D. C., until Aug. 31 for construction of an extension (including plumbing, heating apparatus, electric conduits and wiring) of the U. S. post-office and court-house at Little Rock.

LITTLE ROCK, ARK.—Buildings and improvements to the cost of $75,000 will be begun at Logan H. Roots Memorial Hospital within 60 days and the hospital property will be extended so as to include an entire half block, bounded by East Markham, Sherman and East Second Sts. John H. Hollis is Acting Mayor. Dr. F. L. French is interested.

SAN ANTONIO, TEX.—We are officially advised that C. C. Gibbs will erect an 8-story office building, fronting 42 ft. on Houston St. and 126 ft. on Ave. D. Bids will be received about Aug. 1. Sanguinet & Staats, F. & M. Bank Bldg., Fort Worth, Tex., are Archs.

SAN MARCOS, TEX.—Bids will be received until 2 p. m., July 27, for the erection of a court-house for Hays County. Ed. R. Kone is County Judge. C. H. Page, Jr., & Bro., are Archs., Austin, Tex.

SEATTLE, WASH.—We are officially advised that J. A. Haight, Colman Bldg., will erect a 7-story reinforced-concrete fireproof office building, 50 × 108 ft., at Second Ave. and Pine St. The plans for this building have been prepared by S. A. Jennings, Arch., 804 Summit Ave., and have been submitted to the Board of Public Works. The building is to be of reinforced-concrete construction and will cost $100,000. Estimates will be received Aug. 10 and 15.

SAN DIEGO, CAL.—Bids will be received by the Board of Education, City Hall, until 7.30 p. m., July 27, for the construction and completion of a 2-story and basement brick addition to the Logan Heights School building, and for the erection of an 8-room brick building at Brooklyn Heights. Plans, etc., may be seen at the office of the Board. H. P. Green is Clk. Bd.

SAN FRANCISCO, CAL.—We are officially advised that John B. Rogers, Ch. Engr., Ocean Shore Ry. Co., San Francisco, is preparing plans for a proposed union depot to be built at the junction of Market St. and Van Ness Ave. The station and terminal tracks will occupy the entire block bounded by Market, Mission, Eleventh and Twelfth Sts. The plans call for an 11-story Class A building, with a frontage of 550 ft. on Market St. and wings fronting 550 ft. on both Eleventh and Twelfth Sts. Properties for the site are being secured. Noted fully on April 2 and May 21.

SANTA ROSA, CAL.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., July 27, for the construction (including plumbing, gas -piping, heating apparatus, electric conduits and wiring) of the post-office at Santa Rosa.

LOGAN, UTAH.—Bids will be received by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., Aug. 27, for the construction, complete, of the U. S. post-office building here.

SASKATOON, SASK.—We are informed that the J. McDIARMID CO., Winnipeg, Man., has been awarded the contract for the construction of a city hospital, of brick and fireproof. Cost, $50,000. W. W. La Chance is Arch.

WATER SUPPLY—IRRIGATION.

(denotes that this work is advertised in Engineering News.)*

WEST SPRINGFIELD (Springfield, post-office), MASS.—The Water Commission July 14 awarded the contract for four carloads of cement water pipe to the HITCHCOCK SUPPLY CO., of Springfield, at $24.18 per ton, delivered. The bid of this company was the lowest of several submitted.

*MANCHESTER, MASS.—Bids were opened on July 10 by the Board of Water Commissioners, Fredk. J. Merrill, Chn., for furnishing and delivering f. o. b. cars Manchester, or Beverly Farms, Mass., about 443 net tons of 16-in. straight bell and spigot coated c.-i. pipe; about 523 net tons 14-in. straight bell and spigot coated c.-i. pipe, and about 12 tons of special castings. The contract was awarded to the U. S. CAST IRON PIPE & FOUNDRY CO., 71 Broadway, New York. Raymond C. Allen is Engr., Manchester.

WALLINGFORD, CONN.—The Freemen of the Borough on July 14 authorized the expenditure of a sum not to exceed $18,000 for the extension of the water supply. About 150 tons of 8 and 10-in. c.-i. pipe (Class A, New England Water-Works Association), will be required and 1,200 ft. of 15-in. vitrified pipe. Whether the work will be done by contract or not has not as yet been decided.

NEW YORK, N. Y.—See under Sewerage.

NEW YORK, N. Y.—Bids are asked until 10 a. m., July 29, by the Board of Health, for furnishing all the labor and materials necessary or required to furnish and install two new boilers, together with all necessary alterations and other work incidental thereto in the boiler-house on the grounds of the Kingston Ave. Hospital, at Kingston Ave. and Fenimore St., Borough of Brooklyn, City of New York. Thomas Darlington, M. D., is Pres. Bd.

FORT WOOD, N. Y.—Plans and specifications are on file at the office of Engineering News, New York, for lowering water-pipe at the post. Bids are asked until Aug. 3.

NEW YORK, N. Y.—The lowest bid opened on July 8 by the Board of Water Supply, gas and Electricity for furnishing, delivering and laying water mains in First Ave., from 110th to 125th Sts., and in 125th St., between First and Third Aves., was submitted by L. D. Gregory, 125th St. and First Ave., at $58,387, including pipe, gates, hydrants, etc. Other bidders were: C. Beckwith, Herkimer, N. Y., $59,643; J. Cornwell, 69 East 127th St., 64,830; P. Goodman, East 133d St., $68,710; Wilton Construction Co., 115 Elliott Ave., $71,038; Atlanta Construction Co., 432 East 91st St., $64,642; M. Schumacher, 400 East 108th St., $68,069; Hanover Construction Co., 129 West 125th St., $62,085; James Rodgers, 1929 Amsterdam Ave., $61,162; Joseph Burns, 103 East 125th St., $66,851.

NEW YORK, N. Y.—Bids are asked by the Board of Water Supply, Gas and Electricity until Sept. 1 for construction of three miles of plain concrete conduit, 17 ft. high and 17½ ft. in width inside. John H. O'Brien, Comr.

NEW YORK, N. Y.—Bids are asked until 2 p. m., July 31, by John H. O'Brien, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying a 72-in. pipe line and appurtenances from Va Stream, L. I., to Amityville, L. I.

BROOKLYN, N. Y.—The only bid opened on July 15 by John H. O'Brien, Comr. W Supply, Gas and Electricity, for furnishing and delivering, erecting and connecting pumping engine, with all its appurtenances foundations and appurtenances complete in place, at the Mt. Prospect Pumping Station, Underhill Ave. and Prospect Pl the Borough of Brooklyn, together with removal of certain designated old mater at the same station, was that of Henry Worthington, 115 Broadway, New York, $16,500.

TRENTON, N. J.—Charles A. Hague, Consulting Engr., 52 Broadway, New York, prepared plans and specifications for a vertical triple-expansion, crank and fly-wheel engine, with a daily capacity of 20,000,000 gallons. Bids for constructing and erecting the same, for continuous service are asked by the Board of Water Commissioners until Aug. 12. J. R. Manning is Pres. Bd.

OVERBROOK, N. J.—Bids were opened July 8 by the Building Committee of the Board of Chosen Freeholders, Newark, N. J., for constructing a water supply and sewerage system at the County Hospital, Overbrook, consisting of two electric pumps and one compressor, one concrete reservoir, 100 ft. in diameter and 30 ft. high, 3,230 ft. of 12-in. and 7,200 ft. of 6-in. c.-i. pipe, with specials and hydrants, concrete intercepting basin, 1,500 ft. of 10-in. and 5,950 ft. of 8-in. vitrified sewer pipe, with basins and connections. The contract was awarded to the HARRISON CONSTRUCTION CO., of Newark, at $49,609.

*TRENTON, N. J.—Bids are asked by the Board of Water Commissioners until 2 p. m., Aug. 12, for building and erecting a pumping engine ready for continuous service, with all necessary work and appurtenances at the pumping station here. Charles A. Hague is Consulting Engr.

BROWNSVILLE, PA.—The Brownsville Water Co. has awarded the contract for the construction of a filter bed at the water plant here to E. B. GRIBBLE & CO., at $7,000.

*PITTSBURG, PA.—Bids are asked until 10 a. m., Aug. 3, by the City Controller for the construction of filters, pipe gallery, conduits, piping, fixtures and appurtenances in O'Hara Township, Allegheny County, Pa., for the City of Pittsburg. Alexander B. Shepherd is Acting Dir. Pub. Wks. Table of itemized bids received for this work on June 29 is given in this issue under Contract Prices. These bids were rejected.

PHILADELPHIA, PA.—Ballinger & Perrot, Archs., have awarded the contract to CRAMP & CO., for a 150,000-gallon reinforced concrete reservoir and a pump house in connection with it for the Ivins, Dietz & Metzgar Co., Marshall and Seventh Sts. and Lehigh Ave. Work will be begun at once.

WASHINGTON, D. C.—The contract for furnishing curb and corporation cocks, bids for which were opened on June 27 by the Commissioners of the District of Columbia, has been divided between the ANDERSON COUPLING CO., the A. P. SMITH MFG. CO., and the H. MUELLER MFG. CO.

ATLANTA, GA.—The U. S. CAST IRON PIPE & FOUNDRY CO., of Chattanooga, Tenn., has been awarded the contract for 1,200 tons of water pipe at $18.83 per ton. Bids were opened on July 9.

The contract for three 300-HP. horizontal water-tube boilers has been awarded to the BABCOCK & WILCOX CO., 85 Liberty St., New York, N. Y., for high pressure Sterling boilers. Bids were opened on July 8. Park Woodward is Gen. Mgr.

DE FUNIAK SPRINGS, FLA.—The city will erect a water tank and tower and lay water-piping of from 3 to 8 ins. A. G. Douglass is City Clk.

BIRMINGHAM, ALA.—The American Water-Works & Guarantee Co. has engaged John W. Hill, First National Bank Bldg., Cincinnati, Ohio, as consulting engineer on the proposed Cahaba dam, to increase water supply of Birmingham. The dam will be of masonry, cut stone, concrete and cyclopean rock, 60 ft. high and about 300 ft. long, founded on bedrock. Capacity, 6,000,000,000 gallons.

ENSLEY, ALA.—The contract for the erection of a 35,000-HP. water softening and purifying system has been awarded to the WILLIAM B. SCAIFE & SON CO., of Pittsburg, Pa., by the Tennessee Coal, Iron & R. R. Co., at $50,000. The plant is to be an intermittent system of softening and purifying the waters of Yellow Creek here, before feeding the liquid into the boilers of the coal company to prevent the scaling and corrosion of the boilers.

RUSSELVILLE, ALA.—Bids are asked until Sept. 1, by the town for the construction of a water and lighting plant. W. H. Austin is Town Clk.

PLAQUEMINE, LA.—The city has awarded the contract to W. P. CONERY, of the Plaquemine Electric Light & Power Co., to install water-works here.

NEW ORLEANS, LA.—The D'OLIER ENGINEERING CO., 121 South Eleventh St., Philadelphia, has been awarded the contract for electrical and pumping machinery to be installed in Sewerage Station "C," Algiers, at $22,004 (bid excludes one 1,000,000-gallon triplex pump and motor and two 5-HP. motors under option reserved in the specifications). List of bidders noted on July 16.

DICKSON, TENN.—The city has awarded the contract to J. H. FALL & CO., of Nashville, Tenn., representing the United States Cast-Iron Pipe & Foundry Co., 348 Sixth St., Pittsburg,

Pa., ... $10,000 for furnishing the material required in the construction of water-works, including 10 or 12 carloads of 6 and 8-in. water pipe and a carload of lead and fittings.

GLENDALE, KY.—JOSEPH McWILLIAMS & CO., Louisville, Ky., have been awarded the contract for constructing a filtration plant and making other improvements to the Kentucky Schools of Reform at Glendale. H. Doak is Supt.

NEWARK, OHIO.—The Board of Public Service on July 13 rejected all bids for the construction of an extension to the water-works as irregular. New bids will be asked.

SPRINGFIELD, OHIO.—The U. S. CAST IRON PIPE & FOUNDRY CO., Rookery Bldg., Chicago, Ill., has been awarded the contract by the city for water pipe, at the following prices: 6-in. $21.85; 12-in., $21.85; 16-in. $21.85. No bid was submitted on special castings. Other bidders were: Massillon Iron & Steel Co., $23, $23, and $22.75; B. & S. Pipe Co., $50 per ton. Dimmick Pipe Co., Birmingham, Ala., $23.10, $22.50, $22.50; for special casting, 2½ cts. per lb.

NEWARK, OHIO.—Bids are asked by the Board of Public Service until July 30 for furnishing labor, lead and jute material for the excavation and laying of 86,275 ft. of 4, 6 and 16-in. c.-i. pipe, setting valves and hydrants and repaving 3,000 sq. yds. with brick. Riggs & Sherman Co., of Toledo, Ohio, are Engrs.

*JERSEYVILLE, ILL.—Bids are asked by the Commissioners of the Nutwood Drainage and Engineering District, Jersey County and Green County, Ill., until 2 p. m., Aug. 19, for furnishing and erecting a pumping plant and sluiceways, including equipment. The Harmon Engineering Co., Peoria, Ill., are Engrs. Plans and specifications are on file at the office of Engineering News, New York.

OTTAWA, ILL.—Bids are asked until 1 p. m., July 27, by W. A. Dunaway, County Surv., Ottawa, for furnishing vitrified tile, f. o. b. cars at Sieberling switch, west of here, near the County House. Paul Zickler is Chn. Pub. Bldg. Com.

SPRINGFIELD, ILL.—Bids are asked until 3 p. m., Aug. 1, by Roy R. Reece, Mayor, for the construction of a concrete dam across the Sangamon River, near the water-works pumping station.

MILWAUKEE, WIS.—The following bids have been received for laying a 36-in. water main in East Division: EDWARD O'DONNEL, Milwaukee, $2.07 per lin. ft. (awarded contract); Blake Bros., $2.12; Hase & Welker, $2.60; R. J. Hickey, $2.17.

WAPELLO, IOWA.—The citizens on July 7 voted in favor of constructing water-works. Estimated cost, $15,000. Bids for material and machinery have not as yet been asked. The National Co., of South Bend, Ind., are Engrs.

CHEROKEE, IOWA.—The contract for 3,200 ft. of 4 and 2-in. galvanized iron pipe for water-works extension has been awarded to SWANSON & BETSWORTH, of Cherokee. Bids were opened on July 7. William Shardlow is City Clk.

JANESVILLE, MINN.—Bids are asked until 7.30 p. m., July 31, by L. D. Rogers, Village Recdr., for the construction of a water-works system.

CONCORDIA, KAN.—The general contract for the extension and improvement of the water-works system was awarded by the Council on July 8 to W. A. REES, of Fayetteville, Ark., at $5,027, with the privilege of cutting out of his bid the poles and electric wire mentioned therein and omitting the concrete valve boxes and furnishing c.-i. boxes in their place.

Contracts for hydrants and valves and for c.-i. pipe were awarded to the LUDLOW VALVE CO., of Troy, N. Y., and to the U. S. PIPE & FOUNDRY CO., of Chicago, Ill.

BONNER SPRINGS, KAN.—The citizens have voted in favor of issuing $25,000 of bonds for the construction of a municipal water-works system.

SIDNEY, NEB.—Bids are asked until 7.30 p. m., July 27, by Leslie Neubauer, Village Clk., for the construction and completion of a water-works system.

TOWNER, N. DAK.—W. I. GRAY & CO., of Minneapolis, Minn., have secured the contract for constructing water-works here, at $10,680. Lyken & Robinson, of Grand Forks, N. Dak., are Engrs.

BELLE FOURCHE, S. DAK.—The award of contract to Tom Burke, of Belle Fourche, for the construction of five miles of laterals under the Belle Fourche irrigation project has been withdrawn and the contract reawarded to L. W. DOTSON, of Orman, S. Dak.

This contract was awarded to Mr. Burke on June 25, but before it was prepared for execution he had left the town. The work involves the excavation of about 45,000 cu. yds. of materials and Mr. Burke's bid was $2,637. Mr. Dotson's proposal was $2,655.

GUYMON, OKLA.—The Guymon Electric Light & Power Co. has been incorporated with a capital stock of $40,000 for the purpose of installing an electric light, water and sewerage system here. The incorporators are J. H. Wright, R. S. Cox and others.

DUNCAN, OKLA.—The city has decided to make extensions to the water-works system, for which $20,000 of bonds were recently voted. Charles E. Murphy is Mayor.

MONTROSE, COLO.—The Secretary of the Interior has approved the contract entered into by the Engineer-in-Charge of the Uncompahgre Valley irrigation project, Colorado, on behalf of the United States, with CHARLES RAISH, of Montrose, Colo., for hauling coal and supplies in connection with the construction work. The contract incurs a liability of about $40,380, based upon approximate estimates, which may vary as the necessities and requirements of the work dictate. It is thought the work will extend over a period of about two years.

FORT COLLINS, COLO.—The sum of $1,000,000 will be expended for the construction of the Larimer River and Lone Tree canal. R. O. Terry is Secy. Laramie County Development Co., Fort Collins.

SUNNYSIDE, WASH.—The contract has been awarded to T. RYAN, of Seattle, Wash., for laying about 11,200 ft. of 55-in. and 1,500 ft. of 48-in. continuous wood stave pipe near here, in connection with the Sunnyside irrigation project. The contract amounts to $66,702.

NORTH YAKIMA, WASH.—The Secretary of the Interior has rejected all bids recently received for removing the timber around Lakes Kachess, Keechelus and Cle Elum, Washington, which are to be used as reservoirs in connection with the Yakima irrigation project, and the work will be readvertised.

The bids were rejected because some of the contractors showed a misunderstanding of the basis upon which the proposals were desired, namely on the basis of the actual amount of timber as determined by scale measurement. As but one bid was acceptable, and that covered only one of the four schdules advertised, the Department decided to readvertise all the timber under new specifications.

SAN DIEGO, CAL.—The Common Council on July 6 passd an ordinance appropriating $15,333 for enlarging and improving the University Heights water system.

ARCOLA, SASK.—The rate payers have voted in favor of a water-works system to cost $60,000.

CALGARY, ALB.—JOHN GUNN & SON, Winnipeg, Man., have been awarded the contract for a gravity water-works system for the city, at $153,360. Engineer's estimate, $204,000.

SEWERAGE.

WATERVILLE, ME.—The contract for structing a section of the Hayden Brook sewer was awarded on July 10 by the Sewer Committee to DRURY, McCRACKEN & GILLO, of Waterville, at $7 per ft.

*WOONSOCKET, R. I.—Bids are asked by the Board of Sewer Commissioners, until 2 p. m., July 30, for the construction of about 1,400 ft. of 8-in. sanitary sewer and appurtenances and about 250 cu. yds. of rock excavation. Frank H. Mills is City Engr.

NEW BRITAIN, CONN.—The Board of Public Works has recommended the construction of sewers in the East St. extension, South Stanley St., Henry St., Shuttle Meadow and "A" St. Estimated cost, about $5,300.

BROOKLYN, N. Y.—Bids are asked by Bird S. Coler, Boro. Pres., until 11 a. m., Aug. 5, for furnishing all the labor and material required for constructing sewers in Scott Ave., from Newtown Creek, north of Metropolitan Ave., to St. Nicholas Ave., etc., Section 2.

NEW YORK, N. Y.—Bids were received on July 16 by James W. Stevenson, Comr. of Bridges, for the electrical equipment and the laying of sewers, water pipes and tracks, and the grading and paving of the Plaza, in the Borough of Queens, of the Blackwells Island Bridge over the East River, between the Boroughs of Manhattan and Queens.: Hanover Construction Co., 129 West 125th St., New York, $215,940; McHarg, Bart & Co., 299 Broadway, New York, $218,780; Snare & Triest Co, 143 Liberty St., New York, $223,780; Cooper & Evans Co., 220 Broadway, New York, $209,135; Charles Meads & Co., 299 Broadway, New York, $182,200; Northeastern Construction Co., 225 Fifth Ave., New York, $194,344; James L. Carey, Brooklyn, N. Y., $236,381; Gore Engineering & Contracting Co., 206 Broadway, New York, $202,896; Long Island Contracting & Supply Co., New York, $203,029; Thomas Crimmins Contracting Co., 444 East 69th St., New York, $227,368; Astoria Paving Co., $251,052; Iron Slag Block Paving Co., $230,510; William G. Root, $223,896.

*LAKE PLACID, N. Y.—Bids are asked by the Ruisseaumont Sewerage Commission, Lake Placid, until 1 p. m., Aug. 1, for laying complete about 2¼ miles of sewers. Plans, etc., may be seen at office of W. Z. Larned, 156 Broadway, New York City, or at office of C. E. Collins, Consult. Engr., Drexel Bldg., Philadelphia.

RUTHERFORD, N. J.—Bids are asked until 8 p. m., July 31, by the Borough Council for the construction of a main outlet and lateral connecting sewers in various streets and avenues.

SCOTTDALE, PA.—The Borough Council has awarded the contract for 3,200 ft. of 24-in. sewer pipe to the KANE-OBERKIRSCHER CO., of Toronto, Ont., at 69½ cts. per ft. Other bidders were: The D. J. Kennedy Co., of Pittsburg, Pa., 74¾ cts. per lin. ft.; C. A. Brilhart, of Scottdale, 83¼ cts. per ft.; J. R. Dick, of Scottdale, 75 cts. per ft.; Eicher & Graft, of Scottdale, 74 15-16 cts. per ft.

ALLENTOWN, PA.—GEORGE H. HARDNER has been awarded the contract at about $16,000 for constructing several sewers here.

NEW CASTLE, PA.—MAYBERRY & SON, of this city, have been awarded the contracts for the construction of the Holton and O'Brien St. sewers.

BRACKENRIDGE, PA.—Bids are asked by the Councils until 7 p. m., July 28, for constructing storm sewers in North Canal, Prospect and Stieren Sts., and West Brackenridge Ave. George B. Campbell, New Kensington, Pa., is Borough Engr.

*SAYRE, PA.—Bids are asked by the Borough Council until 8 p. m., Aug. 3, for furnishing all of the material and labor necessary to construct two lateral lines of sewer aggregating 2,170 ft. H. H. Mercereau is Boro. Clk.

TOCCOA, GA.—Bids are asked by the city until August 8 for constructing a sewer system from the Court House, a distance of 2,700 ft., piping to be of terra-cotta, from 6 ins. to 15 ins.

SHEFFIELD, ALA.—Bids are asked until 5 p. m., Aug. 5, by O. E. Comstock, City Clk., for constructing 1,492 lin. ft. of 8-in. pipe sewer, average depth 7 ft. C. L. Peckinpaugh is City Engr.

BESSEMER, ALA.—W. F. Nolan of Bessemer has submitted the lowest bid for the extension of the storm-sewer system.

EAST LAKE STATION (Birmingham postoffice), ALA.—The city has awarded the contract to C. M. BURKHALTER & CO., of Birmingham, for the construction of the sewerage system at $5,120.

HAMLER, OHIO.—Bids are asked until noon, July 24, by W. L. McIntire, Village Clk., for constructing a main outlet sewer in sewer district No. 1.

DAYTON, OHIO.—Bids are asked by the Board of Public Service until noon, July 24, for the construction of storm water sewers in various streets and avenues. William J. Lee is Clk. Bd.

JACKSON, OHIO.—Bids are asked until 1 p. m., Sept. 1, by the village for the construction of about 1 2/5 miles of sanitary sewer. J. W. Turner is Village Engr.

FT. WAYNE, IND.—Bids are asked until July 30 by the Board of Public Works for constructing vitrified clay-pipe sewers in portions af Wayne St. and an alley. Edward J. Lennon is Chn. Bd.

BOONVILLE, IND.—Bids are asked by the City Clerk until Aug. 3 for the construction of a sewerage system. Estimated cost, about $60,000.

MISHAWAKA, IND.—Plans are being prepared for the construction of a sewer system, 12 to 18-in. vitrified sewer tile and 3,100 ft. of 30 and 42-in. reinforced concrete. W. S. Moore, City Hall Bldg., Mishawaka, is Engr.

PERU, IND.—Bids will be asked in about one month for 2,900 ft. of 20-in. vitrified sewer and about 200 ft. of 10-in. vitrified sewer. William O'Hara is City Clk.

GRAND RAPIDS, MICH.—The Council has authorized an issue of $116,000 of bonds for the construction of additional sewers.

ISHPEMING, MICH.—The City Engineer has completed plans and specifications for the construction of sewers for the Sixth Ward, the work requiring 10,882 ft. of pipe, including 712 ft. of 18-in., 232 ft. of 15-in., 2,197 ft. of 12-in., 2,030 ft. of 10-in., 13,522 ft. of 8-in.; 23 manholes, nine flush tanks and 58 catch basins.

BELLEVILLE, ILL.—An ordinance has been passed by the City Council providing for the construction of sewers in Glass Ave. and for paving Gold St. with vitrified brick. Estimated cost, $12,500. Fred Deutschman, Jr., is City Engr.

LA CROSSE, WIS.—OLAF SWENNES has been awarded the contract by the city at about $8,000, for constructing certain sewers here.

VIRGINIA, MINN.—Bids are asked until 8 p. m., July 28, by the City Clerk for the construction of a sewer in sewer district No. 3H.

MILACA, MINN.—Plans have been completed for extending and improving the sewerage system. Estimated cost, $20,000.

FRANKFORT, KAN.—The GEORGE M. KING CONSTRUCTION CO., of Des Moines, Iowa, has secured the contract for constructing a sewerage system here at $20,507. Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., are Engrs.

*OMAHA, NEB.—Bids were opened on July 6 by the City Council for the construction of the Izard and Jones St. sewers as follows: Izard St.—Cooney Construction Co., St. Louis, brick, $154,361; Katz-Craig Construction Co., Omaha, brick, $117,102; Peoples Construction Co., Davenport, Iowa, concrete, $110,902; James Jensen, Omaha, brick, $104,652; J. J. HANIGHEN, Omaha, brick, $96,963, (awarded contract). Jones St.—P. L. KENNEY & CO., Omaha, $34,178 (awarded contract); H. J. Peterson, Omaha, $44,417; J. J. Hanighen, Omaha, $44,989; James Jensen, Omaha, $48,211; McKay & Cathroe, Omaha, $50,792. The bids are all for brick construction. Andrew Rosewater is City Engr.

*WEBB CITY, MO.—Bids are asked by W. E. Smith, City Engr., until 5 p. m., Aug. 3, for the construction of sewers in sewer districts Nos: 32 and 33.

MIAMI, OKLA.—The city has voted $30,000 of bonds for the construction of a sewer system.

EL CENTRO, CAL.—Olmsted & Gillelan, Consulting Engrs., Los Angeles, Cal., are preparing plans for the construction of a sewer system for this city. Estimated cost, about $45,000.

FRESNO, CAL.—Bids are asked until 10 a. m., July 28, by W. O. Miles, County Clk., for the construction of a sewerage system for the County Farm and County Orphanage. Scott McKay is County Surv.

RIO VISTA, CAL.—E. N. Eager, of Fairfield, Cal., is preparing plans for the construction of a sewerage system. Estimated cost, about $15,000. Bids will be asked for in about three months. F. J. Kalber is Town Clk.

SACRAMENTO, CAL.—Bids are asked until July 27 by M. J. Desmond, City Clk., for furnishing, erecting and equipping a battery of two water tube boilers, steam piping and steel breeching for the sewage pumping plant.

GARBAGE DISPOSAL.

BUFFALO, N. Y.—The Council on July 16 approved the ash and garbage contract awarded on July 15 by the Aldermen to the BUFFALO FERTILIZER CO., at $196,700 a year for five years.

BELLAIRE, OHIO.—Bids are asked by the Board of Public Service until Aug. 1 for the construction of a garbage crematory.

TERRE HAUTE, IND.—The City Council on July 9 authorized an issue of $25,000 of bonds for the construction of a garbage crematory.

STREETS AND ROADS.

(* *denotes that this work is advertised in Engineering News.*)

WATERVILLE, ME.—Bids are asked until 2 p. m., July 25, by L. G. Bunker, Mayor, for the construction of a section of state road, 800 ft. in length.

BOSTON, MASS.—Bids were opened on July 13 by the Commissioner of Streets for repaving Summer St., between the A St. bridge and the New York, New Haven & Hartford R. R. bridge. The lowest bid was submitted by James P. Collins.

HARTFORD, CONN.—Only one bid for the paving of Ford St., from Asylum to Pearl Sts., was submitted to the Board of Contract and Supply, that of the Southern New England Paving Co., at $2.25 per sq. yd. for asphalt and $6.90 per cu. yd. for cement in excess of the four inches required under the contract. The bid was referred to the Board of Street Commissioners.

NEW YORK, N. Y.—Bids are asked by George Cromwell, Pres. Boro. of Richmond, until noon, July 28, for regulating and repaving various streets, gutters and terrace.

NEW YORK, N. Y.—Bids are asked until 2 p. m., July 31, by John F. Ahearn, Pres. Boro. of Manhattan, for constructing sidewalks on various streets and avenues in the Borough of Manhattan.

EAST AURORA, N. Y.—The Village Board has awarded the contract for paving Main St. from the Pennsylvania railroad tracks to Olean St. to the GIPP CONSTRUCTION CO., 531 Ellicott Square, Buffalo, N. Y., at $7,000.

LONG ISLAND CITY, (L. I.), N. Y.—Bids were received as follows on July 15 by Lawrence Gresser, Pres. Boro of Queens, for regulating and repaving with granite block pavement on a broken stone and concrete foundation the roadway of Jamaica Ave., from Van Wyck Ave. to the Brooklyn Borough line, Fourth Ward: Gore Engineering & Contracting Co., $232,976; H. P. George, $178,136; O'Connor & McIntyre, $185,348; H. J. Mullen, $173,373; James Kelly, $232,634; Atlanta Contracting Co., $183,443; Peace Bros., $182,425; T. W. Moran, $190,455; Charles Cranford, $174,310; M. J. Fitzgerald, 547 West 45th St., New York, $171,522; James E. Quinn, $184,560; Bart Dunn, $213,700.

The following bids were received for regulating, grading and repaving with macadam pavement the roadway of Metropolitan Ave., from Dry Harbor Road to Jamaica Ave., Second and Fourth Wards: Long Island Contracting & Supply Co., $24,240; E. S. Brower, $29,950; Peace Bros., $22,750; H. J. Mullen, Post Office Bldg., Jamaica, L. I., $17,815; Murphy Bros., $24,950; Atlanta Contracting Co., $23,500; Toumbly & Eldert, $27,930; T. F. Tuchy & Co., $24,850.

NEWBURGH, N. Y.—The following are the bids opened on July 7 by the City Council for paving Liberty St.: Standard Bitulithic Co., paving between and two feet outside rails of street railway track with either Pennsylvania clay or Clearfield vitrified blocks and the rest of street with Warren's bitulithic, $44,014; Hastings Pavement Co., paving between and two feet outside rails of street railway track with either Pennsylvania clay or Mack vitrified blocks and rest of street with 3 × 5 × 12-in. asphalt block, $45,658; the same firm also submitted a supplemental bid on 3 × 5 × 12-in. asphalt block on a 4-in. concrete foundation full width of street, $44,742; Atlantic Bitulithic Co., paving between and two feet outside rail of street railway track with vitrified blocks and the rest of the street with Warren's bitulithic, $49,908; George H. Gifford, vitrified blocks full width of street, with Pittsburg-Buffalo blocks, $42,280; for the full width of the street with Clearfield blocks, $42,865.

NEW YORK, N. Y.—See under Sewerage.

*ATLANTIC CITY, N. J.—Bids are asked by the City Council until July 27 for curbing and gutters. J. W. Hackney is City Engr.

*SALEM, N. J.—Bids were opened on July 6 by the Board of Chosen Freeholders at the office of Josiah Miller, Engr., Salem, for the construction of the Alloway and Aldine Road, a distance of 4.76 miles. The contract was awarded to TUFT & LLOYD, of Salem, at $19,200.

*PLAINFIELD, N. J.—The contract for constructing a macadam road between Plainfield and Fanwood has been awarded to the WELDON CONTRACTING CO., of Rahway, N. J., at $7,201.

SKILLMAN, N. J.—Bids are asked until July 25 by the Executive Committee Board Managers, New Jersey State Village for Epileptics, for furnishing the material and constructing macadam roads on the lands of said village. M. E. Drake is Chn. Com.

*PHILLIPSBURG, N. J.—Bids are asked by the Road Committee of the Board of Chosen Freeholders until 11.30 a. m., Aug. 14, for the following roads in said county, known as the Morris Turnpike and the New Brunswick Turnpike, the former beginning at the Lopatcong Township line and extending to Filmore St., a distance of 6.179 ft.; the latter beginning at the end of the brick pavement on South Main St., Phillipsburg, and extending to the Pohatcong Township line, a distance of 3,966 ft. Bidders may examine the plans, cross-sections and specifications at the Union Square Hotel Phillipsburg. Joseph R. Thatcher is Dir. Bd.

PITTSBURG, PA.—Bids are asked until noon, Aug. 4, by the Commissioners of Allegheny County for the improvement of certain public roads. F. P. Booth is County Controller.

BRACKENRIDGE, PA.—Bids are asked by the Council until 7 p. m., July 28, for curbing and paving North Canal and Cherry Sts. George B. Campbell, New Kensington, Pa., is Boro. Engr.

PITTSBURG, PA.—Bids are asked by the County Commissioners until noon, July 30, for the improvement of the Little Deer Creek Valley road. F. P. Booth is County Controller.

FORT MYER, VA.—Bids are asked by Capt. B. B. Hyer, Constructing Q. M., U. S. A., until 11 a. m., July 27, for grading, filling, drains and extension to road.

SALEM, VA.—The town contemplates the construction of sidewalks either of brick or granolithic. Bids will probably soon be asked.

*LAFAYETTE, LA.—Bids are asked by the City Secretary until Aug. 1 for the construction of cement sidewalks here.

SLIDELL, LA.—BARROW & SMITH, of Slidell, have been awarded the contract for the construction of a highway 3½ miles long, for Dr. Charles P. McCann, to be finished with crushed brick. Work is now under way.

NEW ORLEANS, LA.—The bid of Rudolph S. Blome Co., 79 Dearborn St., Chicago, Ill., for repaving University Ave. with granitoid concrete block at $9,701, has been recommended for award by the City Engineer.

LOUISVILLE, KY.—STAEBLER & MCFARLAND were awarded the contract on July 8 by the Board of Public Works for the construction of granitoid sidewalks at $12,000.

PADUCAH, KY.—The SOUTHERN BITULITHIC CO., of Nashville, Tenn., has been awarded the contract by the city for paving Broadway and Jefferson St. at $2.35 per sq. yd. for 10,000 sq. yds. of bitulithic on 6-in. concrete foundation and 3,800 cu. yds. of grading at 45 cts. per cu. yd.

DAYTON, OHIO.—Bids are asked until July 27 by the Board of Public Service for paving a portion of the Great Miami Boulevard, requiring about 14,000 sq. yds. of plain macadam, 300 lin. ft. of combined cement curb and gutter and 3,500 lin. ft. of protection curb; also for improving portions of Geyer St., Burkhart and Stillwater Aves. by grading and graveling the roadways, etc., and for constructing cement sidewalks on portions of several stree'ts.

RAVENNA, OHIO.—Bids are asked by E. W. Marvin, Village Clk., until July 25, for furnishing the material and improving East Main, South Chestnut, North Chestnut and North Sycamore Sts., and Cleveland Ave., by grading, draining, curbing and paving.

JEFFERSON, OHIO.—The contract for macadamizing 2½ miles of road in Conneaut Township has been awarded to CALLAGHAN & KELLOGG, of Bellevue, Ohio, at $19,546.

PAINESVILLE, OHIO.—Bids are asked until noon, July 28, by the County Commissioners for grading and macadamizing 2½ miles of road in Concord and Leroy Townships. James C. Wonders is State Highway Comr.

TOLEDO, OHIO.—Bids are asked by the Board of Public Service until noon, July 27, for the improvement of a portion of St. James Court. Reynold Voit is Secy. Bd.

CARROLLTON, OHIO.—Bids are asked until noon, Aug. 12, by the Village Council, for grading, draining, curbing and paving portions of West Main or Market St.

ALLIANCE, OHIO.—The Board of Public Service has awarded the contract to J. C. Denne, at $29,745, for paving Patterson St. with Alliance brick.

BROOKVILLE, IND.—Bids are asked by the Commissioners of Franklin County until 1 p. m., Aug. 3, for the construction of 10,300 ft. of gravel road in Ray and Salt Creek Townships. Charles A. Miller is County Audr.

MARTINSVILLE, IND.—Bids are asked by the Commissioners of Morgan County until 2 p. m., Aug. 4, for the construction of 8,064 ft. of gravel road in Brown Township. B. E. Thornburg is County Audr.

GREENSBURG, IND.—Bids are asked by the Commissioners of Clinton County until 2 p. m., Aug. 5, for the construction of gravel roads in various townships. Charles F. Cromwell is County Audr.

COLUMBUS, IND.—Bids are asked by the Commissioners of Bartholomew County for the construction of 2.77 miles, or 10,637 ft., of gravel road in Clay Township, known as the Bonnel road, until 10 a. m., Aug. 3. John M. Davis is County Audr.

FOWLER, IND.—Bids are asked by the Commissioners of Benton and Warren Counties, until 11 a. m., Aug. 17, for the construction of a gravel road on the county line, 13,200 ft. in length. Lemuel Shipman is County Audr.

FRANKFORT, IND.—Bids are asked by the Commissioners of Clinton, until 2 p. m., Aug. 5, for the construction of gravel roads in various townships. Charles F. Cromwell is County Audr.

MUNCIE, IND.—Bids are asked by the Commissioners of Delaware County, until 10 a. m., Aug. 6, for the construction of a crushed stone road in Union Township; for a crushed stone road in Delaware Township; for a gravel road in Center Township; for a gravel road in Washington Township, and for two gravel roads in Center Township, and for two gravel roads in Liberty Township. Joseph E. Davis is County Audr.

BRAZIL, IND.—Bids are asked by the Commissioners of Clay County, until 11.30 a. m., Aug. 6, for the construction of a combination stone and gravel road in Van Buren Township, 7,169 ft. in length, and for the construction of a gravel road in Sugar Ridge Township, 10,600 ft. in length. James L. Burnes is County Audr.

LOGANSPORT, IND.—The County Commissioners on July 9 awarded contracts to A. H. BARNES for the construction of the Martin road and Bechtolheimer road at $9,022 and $4,568 respectively.

VINCENNES, IND.—Contracts for the construction of gravel roads were awarded on July 7 by the County Commissioners as follows: For the gravel road petitioned for by Jasper Sullivan and others, to CHARLES H. RIDGEWAY, at $6,672; for the gravel road petitioned for by J. T. Draper and others, to W. E. RUBLE, at $5,590; for the gravel road petitioned for by John Lindsay and others, to H. F. JONES, at $4,843; for the gravel road petitioned for by J. H. Durham and others, to JOHN S. ROGERS, at $8,285.

WHEATON, ILL.—We are officially advised that bids have been received as follows by the city for paving south district with macadam: Smith & Brown, 78 La Salle St., Chicago, Ill., $53,349; George A. Peter, Sycamore, Ill., $51,157; H. S. Goelitz, Oak Park, Ill., $51,125; Foulkes-Forbes Co., Terre Haute, Ind., $49,296; M. Peterson, 1631 North Sacramento Ave., Chicago, $48,994; Charles M. Porter, 84 La Salle St., Chicago, $47,391. C. A. Prout is City Engr.

AURORA, ILL.—THE McCARTHY IMPROVEMENT CO., of Davenport, Iowa, has been awarded the contract by the city for the improvement of Center Ave., Grant Place, Clark St. and South River St. List of bidders noted last week.

HAMPTON, IOWA.—MAGDEN & SHEELY of Des Moines, Iowa, have been awarded the contract by the city for paving ten blocks of business streets at $1.77 per sq. yd. for paving and 25 cts. per lin. ft. for curbing.

WINONA, MINN.—JOHN DEGNAN has been awarded the contract for paving Mart St., from Main to Center Sts., with vitrified brick block, at $1.25 per sq. yd.; 35 cts. for curb; 25 cts. for retaining curb.

NEODESHA, KAN.—Bids are asked until July 23 by J. J. Carroll, City Clk., for furnishing the material and constructing brick pavement and concrete curb on 16 blocks and on the alleys in two blocks.

LAWRENCE, KAN.—Bids are asked until 5 p. m., Aug. 3, by F. D. Brooks, City Clk., for various street improvements.

JOPLIN, MO.—The Missouri Lead & Zinc Co. has awarded to S. T. DAVIS the contract for constructing about 1¾ miles of macadamized road, including curbing, guttering and sidewalks, across their land, at about $30,000.

*VAN BUREN, ARK.—Bids are asked by the Board of Paving Commissioners until 2 p. m., Aug. 10, for grading and paving Main St., parts of East Main St., Cane Hill St. and Fayetteville St., with brick. The work comprises approximately 19,000 sq. yds. of double brick pavement upon a sand foundation; 4,218 cu. yds. of excavation to be removed; 420 lin. ft. of castings for street crossings; 190 lin. ft. of cement curbing; 420 lin. ft. of cement curb and gutter. Samples of at least six bricks must be deposited with the Engineer ten days before the time of letting the contract. E. L. Matlock is Secy. Bd.

MANUFACTURING PLANTS.

(denotes that this work is advertised in Engineering News.)*

GLENS FALLS, N. Y.—The Well-Haskell Co. has been incorporated with the Secretary of State to manufacture shirts, shirt waists, collars and cuffs. Capital stock, $60,000. The directors are S. J. Jackson, Brooklyn, N. Y.; M. H. Weil, New York; A. H. Silverman and Jeremiah T. Finch, Glens Falls.

BUFFALO, N. Y.—The Larkin Soap Co. will build a 1-story brick addition to its plant at Exchange and Carroll Sts. R. J. Reidpath, 30 Builders' Exchange, Buffalo, Arch., is receiving bids.

RIVERSIDE, N. J.—William Taubel, hosiery manufacturer of this place, will erect a 5-story building, 200 × 60 ft., costing about $60,000, to be used as a finishing plant.

PITTSBURG, PA.—Contracts for machinery and equipment for the plant of the Pittsburg-Buffalo Coal Co., at Marianna, Washington County, Pa., have been awarded to the WESTINGHOUSE ELECTRIC & MFG. CO., 307 Fifth St., and other local concerns. Delivery will be started by Aug. 1. It is the intention of the coal company to build a new mining town with a population of about 15,000. The work involves expenditures of about $3,000,000. (See item under Railways —"Pennsylvania R. R.")

NEW HAVEN, PA.—M. J. Rohn, of Vandergrift, Pa., has purchased eight lots near the West Penn car barns for the erection of a packing house to cost about $15,000.

HAGERSTOWN, MD.—A. T. Zentmyer will establish a foundry to replace his present plant. The main building will be 40 × 150 ft., one story, with a U wing 35 × 50 ft., of concrete blocks with an iron roof, and the pattern-house will be of iron, 30 × 50 ft.

WASHINGTON, D. C.—The VILTER MFG. CO., of Milwaukee, Wis., manufacturers of Corliss engines and refrigerating machinery, has been awarded the contract for a 100-ton icemaking plant for the National Capitol Brewing Co., Washington.

HUNTINGTON, W. VA.—The No Labor Washing Powder Co. has been incorporated with $25,000 capital stock by J. B. Stevenson, T. B. Stackhouse, H. C. Duncan and others.

ROCKINGHAM, N. C.—The Roberdel Mfg. Co., of Rockingham, has filed an amendment to its charter, authorizing an increase of capital stock from $200,000 to $500,000, and may undertake improvements to the present plant, which has 16,500 ring spindles, 725 looms, etc., for manufacturing plaids and ginghams.

ASHEVILLE, N. C.—The Weaverville Electric Co., of Asheville, has been incorporated by R. S. Howland, John H. Carter and G. W. Epps, of Asheville, with a capital stock of $100,000, for the purpose of developing water-power property and transmit electricity for power and lighting. The incorporators contemplate establishing cotton manufacturing plants in this connection.

JUNCTION CITY, GA.—The Junction City Mfg. Co., C. W. Moore, Pres., contemplates manufacturing stoves, ranges and hollow ware, the plant to be in operation by Feb. 1. The order for furnace, etc., will be placed within the next six months.

JACKSONVILLE, FLA.—The Florida National Tobacco Co. has been incorporated with $1,000,000 capital stock with G. D. Jackson, Deland, Fla., Pres.; W. J. Wilson, Green Cove Springs, Fla., Vice-Pres.; A. H. S. Talbot, Jacksonville, Secy.; A. B. Hoyt, Jacksonville, Treas. The purpose is to plant and manufacture tobacco.

HATTIESBURG, MISS.—W. H. Crocker, in care of the J. J. Newman Lumber Co., Hattiesburg, proposes establishing a factory here to manufacture paper from fiber of yellow pine.

MEMPHIS, TENN.—The C. M. Cole Cotton Co. has been incorporated with main offices at Memphis, to deal in and manufacture cotton. Capital stock, $25,000. The incorporators are C. M. Cole, S. M. Neely, R. C. Williamson and others.

The Martin-Phillips Co. of Memphis, has been incorporated with a capital stock of $100,000, for the purpose of dealing in and manufacturing cotton. The incorporators are J. W. Martin, N. H. Martin, Fontaine Martin, S. M. Neely, W. P. Phillips.

WINCHESTER, KY.—Charles Hagan will establish a repair and machine shop here to be built of brick, 40 × 65 × 22 ft., with a concrete floor.

VERSAILLES, KY.—The W. J. Frazier Distilling Co., a corporation composed of Cincinnati and Covington capitalists, has decided to rebuild at once its distillery in this county, on Grier's Creek, five miles west of Versailles, which was destroyed by fire last April.

LORAIN, OHIO.—The officials of the American Shipbuilding Co. have decided to make improvements at the Lorain plant. The directors have appropriated $400,000 to complete the work that has been planned. A new boiler shop will be built, and work on it will be started this summer, a machine shop will also be added to the plant.

CINCINNATI, OHIO.—Extensive improvements, including extra protection against the spread of possible fires, will be made by Burkhardt & Co., oil manufacturers in Eggleston Ave. The company's plant was recently damaged by fire. A number of structures will be erected on the site, including a fireproof building, two stories high, 50 × 100 ft. Joseph G. Steinkamp & Bro., Archs., have been retained to prepare the plans and supervise the erection of the structures.

NEWARK, OHIO.—A. H. Heisey & Co., of Newark, are about to begin work on the erection of an addition to their table glass factory in East Newark. The new building, which is to be used for factory purposes, will be 50 ft. wide, 100 ft. deep and three stories in height.

SOUTH BEND, IND.—The J. C. Lauber Co. has been incorporated with a capital of $100,000 to establish and equip a factory to manufacture sheet metal products and to do a general roof-constructing business. J. C. Lauber, O. J. Klaer and E. Lauber are the Directors.

FORT WAYNE, IND.—The Engineering Co. has been incorporated with a capital of $30,000, for the purpose of establishing a plant to manufacture structural and ornamental iron, tanks, boilers and do a general foundry machinery business. Otto, Gustave and Robert Bengs are the Directors.

FOUNTAINTOWN, IND.—The Fountaintown Elevator Co. has been incorporated to build, equip and operate elevators and mills. Martin Moore, W. M. Patterson and Thomas H. New are the Directors.

EVANSVILLE, IND.—The Indiana Tie Co. has increased its capital stock $37,000 for the purpose of constructing an addition to its tie preserving plant. R. R. Williams is Secy.

INDIANAPOLIS, IND.—The Columbia Meter Co. has incorporated to establish, equip and operate a plant to manufacture electric and other meters. Gustave A. Scheefer, William A. Pugh and Thomas G. Lee are the Directors.

FORT LEAVENWORTH, KAN.—Bids are asked, in triplicate, until 10 a. m., July 24, by Maj. Thomas H. Slavens, Constructing Q. M., U. S. A., U. S. Prison, Fort Leavenworth, for furnishing and delivering f. o. b. here, one brick plant. Proposals for delivery at other points will also be entertained. Bidders must state the time when, and the place where, they propose to make deliveries. Preference will be given to articles of domestic production or manufacture, conditions of quality and price (including in the price of foreign productions or manufactures the duty thereon) being equal, and such preference will be given to articles of American production and manufacture produced on the Pacific coast to the extent of consumption required by the public service there.

Bids are also asked until 10 a. m., July 27, for one saw mill.

LEWISTOWN, MONT.—The Directors of the Cone Butte Mining Co. have voted in favor of a bond issue of $50,000 to provide funds for the immediate erection of a mill, and their action has been approved by the stockholders. The papers were filed recently. R. M. Rae, Pres., has arranged for the sale of the bonds, and work on the mill will be commenced immediately.

KANSAS CITY, MO.—The Blue Island Car & Equipment Co., F. H. Niles, Pres. and Mgr., Chicago, Ill., has leased 18.8 acres of land at Kansas City, on which shops will be built for repairing and constructing railroad cars. A subsidiary company, the Sheffield Car & Equipment Co., has been organized to build and operate the plant.

PINE BLUFF, ARK.—The S. C. Alexander Cotton Cotton Co. has been incorporated here with a capital stock of $25,000, to deal in and manufacture cotton. The officers are S. C. Alexander, Pres.; F. M. Roane, Vice-Pres.; D. P. Burford, Secy.-Treas.

HOUSTON, TEX.—Benjamin J. Cobb, Lake Charles, La., contemplates the establishment of a log and railroad freight plant here.

The Grant Iron Works has been incorporated with $50,000 capital stock, to repair, rebuild all kinds of heavy machinery. J. Grant, Pres. and Gen. Mgr.; H. A. [illegible], First Vice-Pres.; F. E. Pye, Second Vice-Pres., and William A. Grant, Secy.-Treas.

MOGOLLON, N. MEX.—The Mogollon Mining Co. is being organized to build and operate a custom cyanide mill here in the gold mining district of Socorro County. L. [illegible], of Deming, N. Mex., is Pres.

ENTERPRISE, ORE.—The Flora Flour Mill Co., Ltd., has been incorporated with a capital stock of $25,000, and will build a flour mill on the James Bingham ranch, two stories and basement, work to be commenced at once, with the intention of completing it in time for this season's crop. J. Q. [illegible] is Pres., W. H. Baker is Vice-Pres., L. Austin is Secy., Paul Moore is Treas. and F. S. Johnson and R. M. Morton Mgrs.

MISCELLANEOUS CONTRACTS.

(denotes that this work is advertised in Engineering News.)*

U. S. RECLAMATION SERVICE.—All [illegible] relative to canal projects, etc., will be found under Water Supply—Irrigation.

HOSE.—Willimantic, Conn.—The city has decided to purchase 1,000 feet of hose and has asked for an appropriation for that purpose.

DITCH.—St. Paul, Minn.—Bids are asked until 10 a. m., Aug. 3, by Edward G. Kuhlmer, County Audr., for digging and constructing ditch No. 7, Ramsey County.

*WOODEN SCOW.—New York, N. Y.—Bids are asked until noon, Aug. 13, by Col. John G. D. Knight, Corps Engrs., U. S. A., for constructing and delivering one wooden scow.

STEAMER REPAIR.—New York, N. Y.—Bids are asked until 11 a. m., July 31, by William S. Patten, A. Q. M. G., U. S. A., Army Bldg., for repairs to the steamer "Williams."

PLATFORM.—New York, N. Y.—Bids are asked by the Department of Bridges until 2 p. m., July 30, for the construction of a platform at Sands and Washington Sts., Brooklyn Bridge.

NAPHTHA.—New York, N. Y.—Bids are asked by the Department of Bridges, until 2 p. m., July 23, for furnishing and delivering 10,000 gallons of automobile naphtha to the Brooklyn Bridge.

DREDGING.—San Francisco, Cal.—Bids are asked by the Board of State Harbor Commissioners until 9.15 a. m., July 23, for dredging a portion of Channel St. Ralph Parker is Asst. State Engr.

RETAINING WALL.—New Britain, Conn.—The contract for the construction of a considerable length of retaining wall has been awarded to W. B. SPARKS, of this city, at 16 cts. per lin. ft.

IRON FENCE.—New York, N. Y.—Bids are asked until 3 p. m., July 30, by the Department of Parks for furnishing and delivering 1,000 lin. ft. of three-pipe iron fence for parks, Borough of the Bronx.

DRYDOCK.—Bridgeburg, Ont.—The Canadian Ship Building Co. is having plans prepared and will soon commence construction work on a drydock at its shipbuilding plant on the Niagara River at Bridgeburg, Ont., opposite Buffalo.

DREDGING.—Boston, Mass.—Bids were received by the Board of Harbor and Land Commissioners on July 17 for dredging in Ipswich River. Contract was let to the BAY STATE DREDGING CO., 185 Sumner St., Boston, at $2,500.

*CEMENT.—Chicago, Ill.—Bids will be received at the office of the United States Reclamation Service, Federal Bldg., Chicago, Ill., until 10 a. m., Aug. 12, for furnishing 5,000 bbls. of Portland cement, f. o. b. cars at the works of the bidder.

FERRY BOATS.—New York, N. Y.—Bids are asked by Allen N. Spooner, Comr. Docks, until noon, July 29, for furnishing all the labor and materials required for furnishing and delivering miscellaneous duplicate parts for the municipal ferry boats.

PILE DAMS.—New Orleans, La.—Bids will be received until Aug. 10 by Col. E. H. Rutner, Corps Engrs., U. S. A., New Orleans, for furnishing plant, labor and material and constructing sheet pile dams in outlet bayous of Southwest Pass, Mississippi River.

*EMBANKMENT.—Greenville, Miss.—Bids are asked by the Board of Mississippi Levee Commissioners until noon, Aug. 3, for the construction of about 900,000 cu. yds. of embankment in the Mississippi Levee District. Robert Somerville is Asst. Ch. Engr.

DITCH.—Redwood Falls, Minn.—Bids are asked until July 29, by L. P. Larson, County Audr., for constructing Ditch No. 9, the work including 118,960 cu. yds. in open ditch, 1,673 ft. of 24-in., 9,927 ft. of 8-in., 1,000 ft. of 6-in. and 1,000 ft. of 15-in. tile.

DITCH.—Sterling, Ill.—Bids are asked until 2 p. m., July 25, by the Drainage Commissioners of Union Drainage District No. 1 of the towns of Hume and Prophetstown, Whiteside County, Ill., for the work of dredging out the main ditch of the district.

DRAINAGE.—Bloomingdale, Ill.—A drainage district has been organized for the drainage of 300 acres of marsh land. There will be 4½ miles of tile drains, ending with a 20-in. outlet. The cost is estimated at $6,700. A. L. Webster, of Wheaton, Ill., is Engr.

DITCH.—Webster City, Iowa.—Bids were received on July 6 by the Board of County Supervisors, at the office of O. A. Cragwick, County Audr., for constructing Riley Ditch, No. 48. Contract has been awarded to the NORTHERN CONSTRUCTION CO., of Elkhart, Ind. Estimated cost, about $20,000.

TROLLEY TRACKS.—New York, N. Y.—Bids will be received until 2 p. m., July 30, by the Department of Bridges for constructing the outer trolley tracks of the Blackwells Island Bridge over the East River between the Boroughs of Manhattan and Queens.

DITCH.—Kankakee, Ill.—Bids are asked until 2 p. m., July 24, by R. D. Gregg, Engr. Snake Creek Drainage District, for the construction of the Snake Creek ditch and tile branches. The approximate amount of excavation is 5,[illegible] cu. yds. and of tile branches about 30,000 ft.

GRAIN ELEVATORS.—Regina, Sask.—The British American Elevator Co. has completed arrangements for building ten grain elevators along the Brandon-Regina branch of the Canadian Northern R. R. This concern is a branch of the Peavy Elevator Co., Minneapolis.

STEEL PIPE LINE.—Valley Stream, N. Y.—Bids are asked by John H. O'Brien, Comr. Water Supply, Gas and Electricity, until 2 p. m., July 29, for furnishing, delivering and laying 72-in. steel pipe line and appurtenances from Valley Stream, L. I., to Amityville, L. I.

BLOCK SIGNALS.—New York, N. Y.—Bids are asked by the Department of Bridges until 2 p. m., July 30, for the construction of block signals for the elevated railway tracks of the Williamsburg (new East River) Bridge over the East River, between the Boroughs of Manhattan and Brooklyn. J. W. Stevenson, Comr.

FENCES.—New York, N. Y.—Bids are asked by the Department of Parks until 3 p. m., July 30, for furnishing all the labor and materials for completely constructing and erecting boundary and partition fences for the elephant house yards in the New York Zoological Park, in Bronx Park, City of New York.

DREDGING.—Osterville, Mass.—Bids were received by the Harbor and Land Commissioners at Boston on July 17 for dredging a channel in East Bay at Osterville, in the town of Barnstable. Frank W. Hodgdon is Ch. Engr. Contract was awarded to CAVANAGH BROS., 471 Dorchester Ave., Boston, at $7,000.

WALLS, ROOF, ETC.—Boston, Mass.—Bids were received July 16 by the Boston Transit Commission, B. Leighton Beal, Secy., for building a portion of the walls, roof and invert for the enlargement of the subway under the Boston City Hospital Relief Station, Washington St. tunnel. Contract was awarded to COLEMAN BROS., 15 Court Sq., Boston, at $17,050.

GRADING ARCH, ETC.—Connersville, Ind.—Bids were received and contracts let as follows by Jasper L. Kennedy, County Audr., July 10, for construction of one 45 × 45 ft. concrete arch, to the BLOCK BRIDGE & SUPPLY CO., Indianapolis; for a fill on same highway, to consist of 34,250 cu. yds. grading; 2,733 cu. yds. gravel, and 9,840 sq. ft. sodding, to C. C. KING BROS., Montezuma, Ind.

*LOCK AND DAM.—Harrisonburg, La.—Bids were received on July 13 by Capt. Clarke S. Smith, Corps of Engrs., Vicksburg, Miss., for building Lock and Dam No. 2 in Ouachita River at Harrisonburg. The bidders for this work were the H. E. Talbott Co., of Dayton, Ohio, about $420,000, and the Midland Bridge Co., of Kansas City, Mo., about $400,000. Award of contract has not yet been made.

*CANALS, DITCHES.—Angleton, Tex.—Bids will be received until noon, July 30, by the Board of Commissioners, Angleton Drainage District, F. Oberhelman, Chn., at the office of Masterson & Rucks, Angleton, for constructing 31 canals, drains and ditches, requiring a total excavation of approximately 653,238 cu. yds. earth. J. L. Chambers, Engr., Angleton. Bids for separate contracts or the whole work may be submitted.

AMMUNITION.—Washington, D. C.—Bids were received as follows on July 16 at the Bureau of Ordnance, War Dept., Washington, D. C., for furnishing (a) 5,000 3-in. 15-lb. shrapnel and (b) 5,000 21-second combination fuses: Scovell Mfg. Co., Waterbury, Conn., (a) $4.90 each, (b) $3.65 each. Bethlehem Steel Co., South Bethlehem, Pa., (a) $4.62; (b) $5.10. American & British Mfg. Co., Bridgeport, Conn., (a) $3.98.

*REPAIRING PIER.—Grand Rapids, Mich.—Bids were received as follows by Col. M. B. Adams, Corps Engrs., U. S. A., on July 14, for repairing South Pier at Grand Haven, Mich.: Burk, Smith & Nelson, Muskegon, Mich., $19,354; Bennett-Schnorbach Co., Muskegon, $19,689; Robert Love, Muskegon, $20,683; J. E. Hathaway, Milwaukee, Wis., $21,800; Nelson J. Gaylord, Ludington, Mich., $22,567; Greiling Bros., Green Bay, Wis., $22,804.

MARSH IMPROVEMENT. — Leamington, Ont.—Bids are asked by Alex. Baird, C. E., Leamington, until 1 p. m., July 28, for improvement of the marsh drainage system on Pelee Island. The work comprises principally dredge work, with team work, rock blasting, supplying and placing in new pumps of 40,000 gallons capacity per minute, new steam boiler, repairing present pumping plants, building concrete pump pit, spill-way, bridges, etc.

DAMPPROOFING, ETC.—New York, N. Y.—Bids are asked by John W. Brannan, Pres. Bd. Trustees, Bellevue and Allied Hospitals, until noon, July 30, for providing all labor and materials required for the tearing down and removal, excavation, masonry, dampproofing, repairing and replacing of machinery and all other work required to render sound and perfect the dampproofing of elevator pits and damaged elevator machinery at Fordham Hospital, Crotona Ave. and the Southern Boulevard, New York.

DREDGING.—Manitowoc, Wis.—Bids were received as follows by Maj. W. V. Judson, Corps Engrs., U. S. A., Milwaukee, Wis., on July 16, for dredging 70,000 cu. yds. at Manitowoc Harbor: (A) price per cu. yd.; (B) total: Great Lakes Dredge & Dock Co., Chicago, Ill., (A) 17⅝ cts.; (B) $12,425. Samuel O. Dixon, Milwaukee, Wis., (A) 18½ cts.; (B) $12,950. Edward Bros. Dredge Co., Sault Ste Marie, Mich., (A) 19 cts.; (B) $13,300. The Fitz Simons & Connell Co., Chicago, Ill., (A) 20 cts.; (B) $14,000. Greiling Bros., Green Bay, Wis., (A) 18½ cts.; (B) $12,950.

BARGE CANAL.—Albany, N. Y.—Bids are asked by F. C. Stevens, Supt. Public Works, until noon, Aug. 11, for Barge Canal Contract No. 31, which is for improving the Erie Canal at Little Falls and modifying dam and constructing guard gates at Rocky Rift; length of contract is one mile. The work embraced in the contract includes constructing Lock No. 17 with gates and anchorages, lock valves, buffer beams, etc.; four guard gates, complete; substructure, superstructure and approaches for a bridge; storehouses; embankments; wash walls, dry walls, etc. The operating machinery for the lock is not included in the contract. The work must be completed within four years from date of execution of the contract. Engineer's estimate is $813,800. Frederick Skene is State Engr. and Surveyor.

CEMENT INDUSTRY.—Mexico. A. L. M. Gottschalk, U. S. Consul-General, Mexico City, in a consular report covering the cement industry in the Republic of interest to American manufacturers, states that "there is practically an unlimited future for the use of concrete as a building material in this city as well as in other large cities of the Mexican Republic, especially for the hollow concrete block. There are, I am told, in the capital city, only some 300 houses built of concrete, but this comparatively small number is due to the fact that the material only began to find general acceptance with architects and builders a very short time ago, much prejudice having been felt against it owing to the fact that some years ago certain speculators undertook to launch upon the market concrete blocks of so poor a quality that they were universally condemned. This prejudice has, however, entirely disappeared."

*BARGE CANAL.—Albany, N. Y.—The only bids received by F. C. Stevens, Supt. of Public Works, on July 21, for Barge Canal Contracts Nos. 60 and 64 were those submitted by the Empire Engineering Corporation, of 60 Wall St., New York. For Contract No. 60, which is for the improvement of the Erie canal from the west end of Contract No. 6 to about one-half mile west of Adams Basin bridge, a distance of 8.53 miles, the Empire Engineering Corporation bid $1,349,084; the engineer's estimate is $1,267,301. For Contract No. 64, which is for the improvement of the Erie canal from 900 feet west of Prospect Street Bridge, Medina, to 100 feet east of Gasport Bridge, a distance of 9.91 miles, the company bid $1,290,492; the engineer's estimate is $1,207,930. The Empire Engineering Corporation already holds three contracts for Barge Canal construction work, namely, Contracts Nos. 1, 4 and 5. Itemized prices will be given next week under Contract Prices.

*DREDGING.—Boston, Mass.—Bids are asked until 2 p. m., July 31, by the Board of Harbor and Land Commissioners, State House, for dredging an anchorage basin at Winthrop, Mass. Frank W. Hodgdon, Ch. Engr.

DRY DOCK.—Bremerton, Wash.—Bids were received as follows on July 18 at the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for the construction of a concrete and granite dry dock at the Puget Sound Navy Yard, Bremerton, Wash.: Cowsey-Lohse-Winters & Co., Lowman Bldg., Seattle, Wash., (1) $2,225,000; (2) $2,101,000; (3) $2,118,148; (4) $2,058,700; (5) $6,721; (6) $7,700; (8) $5,000; (9) 40 cts.

West Lake Construction Co., 717 Locust St., St. Louis, (1) $2,227,000; (2) $2,111,000; (3) $2,243,500; (4) $2,127,500; (5) $5,800; (6) $10,000; (7) $9,000; (8) $4,800; (9) 45 cts.; (10) on bidders' specifications, $330,000; $271,000.

C. J. Erickson, 218 Columbia St., Seattle, Wash., (1) $1,625,000; (5) $1,000 per ft.; (9) 45 cts.

James Black Masonry & Contracting Co., Wright Bldg., St. Louis, (1) $1,999,196; (2) $1,915,000; (3) $1,967,196; (4) $1,882,196; (5) $5,800; (6) $11,000; (7) $2,000; (9) 65 cts.; (10) $1,953,196; $1,799,196; $1,770,196; bids on (1), (2), (3), (4) and (10) reduced by telegraph $65,000.

Puget Sound Bridge & Dredging Co., 95 Yesler Way, Seattle, Wash., (1) $1,975,000; (2) $1,880,000; (3) $1,965,000; (4) $1,882,000; (5) $5,000; (6) $17,000; (8) $3,000; (9) 30 cts.; (10) $1,710,000; $1,653,000; $1,700,000; $1,642,000.

CONTRACT PRICES.

*DAM GATES.—Wheeling, W. Va.—Bids were received as follows on July 9 by Capt. F. W. Altstaetter, Corps Engrs., U. S. A., for constructing and erecting steel gates for locks at Dams Nos. 18 and 13, Ohio River: (A) Lawrence D. Weaning, Cleveland, Ohio; (B) Penn Bridge Co., Beaver Falls, Pa.; (C) Pennsylvania Contracting Co., Pittsburg:

Dam No. 18—	(A)	(B)	(C)
422,000 lbs. structural steel	$0.06	$0.0576	$0.045
68,000 " forgings	.0375	.0847	.076
7,750 " bolts, etc.	.0535	.0656	.045
24,000 " machinery steel	.0435	.0679	.064
36,500 " iron castings	.0325	.051	.042
36,200 " steel castings	.0925	.10	.064
2,340 " alloys	.35	.488	.25
10,300 ft. B. M. common timber, per M.	35.00	60.00	65.00
2,650 ft. B. M. oak timber, per M.	65.00	60.00	75.00
Total	$35,215	$39,605	$31,346

Dam No. 13—	(A)	(B)	(C)
422,000 lbs. structural steel	$0.06	$0.0576	$0.045
68,000 " forgings	.0375	.0847	.076
7,750 " bolts, etc.	.0535	.0656	.045
24,000 " machinery steel	.0435	.0679	.064
36,500 " iron castings	.0325	.051	.042
36,200 " steel castings	.0925	.10	.064
2,340 " alloys	.35	.488	.25
10,300 ft. B. M. common timber, per M.	35.00	60.00	65.00
2,650 ft. B. M. oak timber, per M.	65.00	60.00	75.00
Total	$35,215	$39,605	$31,346

*FILTRATION EXTENSION.—Pittsburg, Pa.—Bids were received in detail as follows on June 29 by the City Controller, for the construction of filters, pipe gallery, conduits, piping, fixtures and appurtenances in O'Hara Township, Allegheny County, Pa., for the City of Pittsburg. Morris Knowles is Ch. Engr. (A) Engineer's estimate; (B) Westwater & Casey, Columbus, Ohio; (C) Booth & Flinn, Pittsburg; (D) David Peoples, Betz Bldg., Philadelphia. (These bids have been rejected and new bids are asked until Aug. 3, as advertised in Engineering News.)

	(A)	(B)	(C)	(D)
1,300 ft. fence	$0.50	$0.40	$1.00	$0.35
14,000 cu. yds. excavation top soil	.35	.50	.50	.45
216,000 " " " general excavation	.20	.30	.45	.35
8,000 " " " excavation in trench	1.00	1.00	.70	.50
110,000 " " " filling on property east	.20	.30	.30	.15
30,000 " " " filling on property south	.30	.30	.50	.20
11,000 " " " embankment	.15	.30	.40	.25
65,000 " " " filling over vaulting	.20	.40	.40	.45
50,000 t. m. ft. rolling	.02	.06	.10	.25
3,000 cu. yds. broken stone or gravel filling	.80	1.50	.75	2.50
11,000 " " " concrete in floors	5.75	6.00	7.00	6.50
2,500 " " " concrete in revetment	6.50	6.00	7.50	6.50
1,700 " " " concrete in trench	6.00	9.50	7.50	6.00
14,000 lin. ft. piles driven vertically	7.50	7.30	7.50	8.50
11,200 " " " concrete in piers	5.00	5.60	6.50	7.50
442,000 sq. ft. arch centering	.06	.15	.10	.10
1,100 cu. yds. reinf. con. in cond. & drains	9.50	8.10	9.00	7.50
3,900 " " " miss. reinf. concrete	9.50	12.50	9.00	10.00
2,500 " " " concrete in revetment	6.50	14.50	10.00	6.00
100 " " " concrete in trench	6.00	9.50	7.50	6.00
14,000 lin. ft. piles driven vertically	.50	1.00	.60	.40
9,500 " " " piles driven on batter	.65	1.00	.60	.50
45 M. ft. B. M. footing timber	100.00	75.00	50.00	40.00
480,000 lbs. steel reinforcement	.03	.04	.03½	.06
50 cu. yds. brick masonry	12.00	15.00	12.00	16.00
100 sq. yds. water proofing	.75	.60	1.25	1.65
220 ft. 57" riveted steel pipe	13.50	13.50	10.00	20.00
220 " 57" lock-bar steel pipe	....	15.00	14.00	20.00
360 " 54" riveted steel pipe	12.50	13.10	10.00	18.50
360 " 54" lock-bar steel pipe	....	14.50	14.00	18.50
360 " 48" riveted steel pipe	11.00	11.30	10.00	16.00
360 " 48" lock-bar steel pipe	....	12.25	14.00	16.00
360 " 42" riveted steel pipe	10.00	10.50	10.00	15.00
360 " 42" lock-bar steel pipe	....	11.40	14.00	15.00
340 " 30" riveted steel pipe	9.00	8.55	10.00	11.00
340 " 30" lock-bar steel pipe	....	8.80	14.00	11.00
4.1 tons cast steel specials	200.00	140.00	100.00	100.00
85 " c.-i. hub and spigot pipe	45.00	60.00	50.00	54.00
21 " c.-i. hub and spigot pipe specials	90.00	95.00	90.00	150.00
35 " c.-i. flanged specials	120.00	145.00	100.00	100.00
4,000 lbs. brass pipe and fittings	.30	.40	.30	.35
3 each 2" brass air cocks	4.00	10.00	10.00	10.00
5 " 1" brass air cocks	2.00	2.50	10.00	8.00
10 " filter ent. doors	800.00	800.00	550.00	475.00
10 " filter ent. doors	....	800.00	550.00	475.00
10 " 20" bev. gear stop valves	130.00	120.00	150.00	200.00
10 " 20" spur gear stop valves	120.00	117.00	150.00	200.00
20 " 20" stop valves	110.00	90.00	125.00	110.00
3 " 16" stop valves	85.00	65.00	85.00	83.00
10 " 12" spur gear valves	50.00	65.00	100.00	120.00
10 " 12" stop valves	45.00	41.00	60.00	60.00
2 " 10" stop valves	35.00	33.00	50.00	50.00
5 " 3" stop valves	10.00	6.00	15.00	11.00
60 " indicator stands	20.00	18.00	20.00	60.00
60,000 lbs. misc. wrought iron and steel	.06	.05	.05	.10
18,000 lbs. miscellaneous cast iron	.05	.05	.05	.06
11 each manhole frames and covers	15.00	7.00	20.00	10.00
9 " catch basin frames and covers	12.00	12.00	20.00	20.00
80 " ventilator frames and covers	11.00	15.00	20.00	20.00
Steam piping (lump)	1,000.00	1,500.00	2,000.00	25,000.00
1,600 sq. ft. skylights	1.40	1.30	2.00	2.00
Gal. partitions and finishings (lump)	200.00	700.00	1,000.00	15,000.00
260 ft. pipe railings	.85	.75	2.25	1.25
1 Venturi meter	850.00	1,200.00	1,500.00	1,000.00
850 tons grooved girder rail	70.00	50.00	50.00	60.00
850 tons tee rail	....	55.00	50.00	60.00
85,000 lbs. cast steel brackets	.08	.06	.05	.08
2,000 sq. yds. telford-macadam roadways	1.40	1.30	1.40	1.44
50 sq. yds. macadam paths	1.00	.75	1.00	1.44
450 ft. concrete curb and gutter	.75	.60	1.00	1.00
350 sq. ft. paved gutters	3.00	.25	2.75	.25
500 ft. 6" terra cotta pipe	.25	.25	.40	.40
300 ft. 10" terra cotta pipe	.50	.40	.60	.60
Gallery entrance (lump sum)	4,000.00	7,000.00	10,000.00	10,000.00
15 acres seeding	60.00	100.00	75.00	50.00
700 sq. yds. sodding	.35	.50	.75	.60
Total.				
Bids incl. riveted steel pipe, type A door and girder rail	$510,019	$644,653	$647,892	$682,927
Bids incl. lock-bar pipe, type B door and T-rail	....	649,488	654,452	682,927
Bids incl. riveted steel pipe, type B door and T-rail	....	647,903	647,892	682,927
Bids incl. lock-bar pipe, type A door and girder rail	....	646,238	654,452	682,927
Bids incl. riveted steel pipe, type A door and T-rail	....	648,903	647,892	682,927
Bids incl. lock-bar steel pipe, type B door and girder rail	....	645,238	654,452	682,927
Bids incl. riveted steel pipe, type B door and girder rail	....	643,653	647,892	682,927
Bids incl. lock-bar steel pipe, type A door and T-rail	....	650,488	654,452	682,927

U. S. POSSESSIONS AND CUBA.

TIES.—Panama.—The Isthmian Canal Commission, Washington, D. C., has awarded contract for furnishing 18,000 hewn cypress cross-ties and a smaller amount of switch ties to D. L. GILLESPIE & CO., 463 Water St., Pittsburg, Pa., at a total sum of $13,814.

LUMBER.—Panama.—Bids were received as follows July 21 at the office of the Isthmian Canal Commission, Washington, for (a) creosoted piling; (b) creosoted lumber (250,000 ft. B. M.); (c) untreated lumber (125,000 ft. B. M.): Atlantic Creosoting & Woodpreserving Works, Norfolk, Va., (a) $24,345.50, 120 days; short-leaf, $19,317.65, 110 days; $17,894.50, 140 days; (b) $12,-311.66. Chicago Lumber & Coal Co., Mobile, Ala., bid on all or none, (a) $26,839.24, 130 days; (b) $13,776.22, 130 days; (c) $2,475.47, 130 days. G. Elias & Bro., 965 Elk St., Buffalo, N. Y., (c) $2,455.90, 60 days. Gulfport Creosoting Co., Gulfport, Miss., (a) $24,874.75, 90 days; (b) $13,894.92, 90 days; alternate bids, (a) $22,228.50, piling as low as 40% heart; (b) $12,734.26, square edge and sound, 90 days. S. E. Naylor & Co., Gulfport, Miss., (c) $2,113.39, 60 days. Puget Sound Wood Preserving Co., Lowell, Wash., final inspection at point of shipment for quality, (a) $29,429.12; (b) $9,817.77; (c) $2,831.28, all, 150 days. Southern Creosoting Co., Ltd., Slidell, La., (a) $24,-874.74, $23,816.25, 40% heart when creosoted, 90 days; (b) $13,120.98, $12,657.52, square edge and sound, 90 days. Southern Sawmill Co., Ltd., Hennen Bldg., New Orleans, final inspection for quality at point of shipment, (a) $21,170, 90 days; (b) $11,-793.87, 105 days; (c) $2,324.34, 45 days. West Pascagoula Creosoting Works, West Pascagoula, Miss., (a) $21,699.25; (b) $12,525.65, both 120 days. Norfolk Creosoting Co., Norfolk, Va., final inspection for quality at point of treating, (a) $24,722.25, 44 cts. and 45 cts. per ft., 24-lb. creosote; (b) $14,525.24, $55 per M., 24-lb., $49 per M., 16-lb. creosoting, both 115 days. W. B. Grace & Co., New York, La Boca delivery, (a) $22,-493.125; (b) $9,898.42; (c) $2,761.25, all, 90 days. Arthur Gamwell, Seattle, Wash., (a) $25,404; (b) $10,805; (c) $1,967; all, 120 days.

EXPLOSIVES.—Panama.—Bids were received as follows on July 6 at the Isthmian Canal Commission, Washington, D. C., for furnishing 90,000 lbs. saltpetre dynamite, 30 per cent. nitroglycerin and 2,000,000 lbs. same, 45 per cent. nitroglycerin: E. I. Du Pont de Nemours Powder Co., New York, $238,405; Keystone Powder Mfg. Co., Emporium, Pa., half of the quantity specified, $122,112; Atlas Export & Trading Co., New York, 90,000 lbs. 30% $9,720; 150,000 lbs., 45%, $17,595. The Commission has awarded contracts as follows: E. I. DU PONT DE

NEMOURS POWDER CO., 45,000 lbs. 30% nitroglycerin, and 2,000,000 lbs. 45% nitroglycerin dynamite, for $233,902. To the KEYSTONE POWDER MFG. CO., at $4,612 for 45,000 lbs. 30% nitroglycerin.

EXPLOSIVES.—Panama.—Bids were received as follows July 20, at the office of Captain F. C. Boggs, Gen. Purchasing Officer, Isthmian Canal Commission, Washington, D. C., for dynamite and other explosives, as follows: (a) 270,000 lbs. saltpeter dynamite, 30% nitroglycerine; (b) 5,500,000 lbs. 45%; (c) 2,500,000 lbs. 60%; (d) 500,000 blasting caps, quintuple strength; (e) 396,100 electric fuses, 2 ft. to 60 ft. long: E. I. Dupont de Nemours Powder Co., 90 West St., New York, (a) $26,460, (b) $588,500, (c) $292,500, (d) $2,691, (e) $64,665; Keystone Powder Mfg. Co., Emporium, Pa., (a) $27,675, (b) half quantity, $309,375, (c) $318,750; R. C. Walbey, 75 Webster St., San Francisco, (d) $2,312; Star Electric Fuse Works, Wilkes-Barre, Pa., (e) $107,042.

CIVIL SERVICE EXAMINATIONS.

ASSISTANT.—Washington, D. C.—The U. S. Civil Service Commission announces an examination on Aug. 12-13, to secure eligibles from which to make certification to fill a vacancy in the position of Assistant, at $1,400 a year, in the Naval Observatory, Navy Dept., Washington, D. C., and vacancies requiring similar qualifications as they may occur. Age limit, 20 years or over on the date of the examination, but preference in appointment will be given to eligibles under 35 years of age. Application Form 1312.

SURVEYOR OF MINERAL DEPOSITS.—Washington, D. C.—The U. S. Civil Service Commission announces an examination on Aug. 5, to secure eligibles from which to make certification to fill one or more vacancies in the position of Surveyor for the Inspection of Mineral Deposits, Land Office Service, in the different field divisions in the West, at a minimum salary of $1,500 a year and expenses, and vacancies requiring similar qualifications as they may occur. Age limit, 20 years or over. Application Form 1312.

ENGINEER IN WOOD PRESERVATION.—Washington, D. C.—The U. S. Civil Service Commission announces an examination on Sept. 2, to secure eligibles from which to make certification to fill vacancies as they may occur in the position of Engineer in Wood Preservation (male), in the Forest Service, Dept. of Agriculture, at an entrance salary of $1,000 a year. It is anticipated by the Department that about eight vacancies will be filled as the result of this examination. Age limit, 22 to 40 years. Application Form 1312. Applications must be filed before closing hour on Aug. 22.

CHIEF ENGINEER, CLASS 3.—Philippines.—The U. S. Civil Service Commission announces an examination on Aug. 3, to secure eligibles from which to make certification to fill a vacancy in the position of Chief Engineer, Class 3, $115 a month, in the Coast and Geodetic Survey, for service in the Philippines, and vacancies requiring similar qualifications as they may occur in that Survey. The Department states that the appointee to the specific position mentioned will, upon his arrival at Manila, be promoted to the position of Chief Engineer, first class, at $140 a month. It will not be necessary for applicants to appear at any place for examination. Age limit, 25 to 45 years. Application Form 304 and special forms.

TRADE PUBLICATIONS.

PUSH-BUTTON SPECIALTIES. — Cutler-Hammer Mfg. Co., Milwaukee, Wis. Paper; two pamphlets; 3½ × 6 ins., with 15 pp. and 6 × 3½ ins. with 16 pp.; both illustrated.

The first of these relates to the mechanism of a new line of specialties in push-button pendent switches, cap switches, surface switches, and pendent lamp-sockets with push-button switches. The second pamphlet gives the electrical features, weights and prices.

KEWANEE POWER BOILERS.—The Kewanee Boiler Co., Kewanee, Ill. Catalog No. 50. Paper; 6 × 9 ins.; pp. 78; illustrated.

The manufacturers have issued this catalog with the intention of correcting the impression that they make a specialty of heating-boilers, and do not solicit high-pressure power-boiler business. Tubular boilers are shown for 100, 125 and 150 pounds working pressure. A plan of suspending boilers independently of the setting is clearly illustrated, and a table of specifications is given for the beams and channels to be used in this type of suspension. The catalog contains a complete series of diagrams of boiler heads, showing arrangement of tubes and braces, and of longitudinal riveted joints.

For other Proposal Advertisements see pages 43, 44, 45, 46, 50, of Advertisements and Construction News page 36.

DEPARTMENT OF THE INTERIOR, U. S. Reclamation Service, Washington, D. C., July 18, 1908.—Sealed proposals will be received at the office of the United States Reclamation Service, Federal Building, Chicago, Illinois, until 10 o'clock a. m., August 12, 1908, for furnishing 5,000 barrels of Portland cement, f. o. b. cars at the works of the bidder. For particulars address the U. S. Reclamation Service, Washington, D. C. FRANK PIERCE, Acting Secretary.

BOILERS, STEAM ENGINES, GAS ENGINES AND CENTRIFUGAL PUMPS.

Jerseyville, Ill.

1. Sealed bids will be received by the Commissioners of the Nutwood Drainage and Levee District, Jersey County and Green County, State of Illinois, at their office in Jerseyville, Illinois, until 2 o'clock p. m., Wednesday, August 19, A. D. 1908, at which time and place said bids will be publicly opened; said bids shall be for furnishing and erecting a pumping plant and sluiceways, including one 300-HP. water tube steam boiler, one 500-I.HP. horizontal compound condensing steam engine, one 48-inch and one 36-inch centrifugal pump, together with all foundations, appurtenances, piping, etc., necessary for complete working plant as described in detail in the specifications therefor on file with the Secretary of said Commissioners. Alternate bids will also be received for gas producers and gas engines, instead of steam boilers and steam engines.

2. Bids will be received and considered upon any one or more of the parts of said work as described in the plans and specifications hereinafter mentioned, and any bidder may submit alternate bids based upon two or more parts of the work being awarded to him, but the consideration of such alternate bids by the Commissioners will not restrict their right to determine as to the lowest and best bid on each part.

3. The envelopes containing the bids shall each be plainly addressed to the "Commissioners of Nutwood Drainage and Levee District," and each shall show plainly upon the outside the name of the bidder and the facts that the envelope contains bids, plans or description.

4. Plans and specifications are on file and may be seen at the office of the Commissioners of said District in the City of Jerseyville, Illinois, at the office of the Harman Engineering Co., Engineers, 120 Fredonia Avenue, Peoria, Illinois, and at the office of the Secretary of the Western Society of Engineers, Monadnock Bldg., Chicago, Illinois. Copy of the specifications, Form of Contract and Form of Bid may be procured by application to the Engineers.

5. Payments will be made in cash as follows, viz.:

ON PARTS I, II and III, 25 per cent. of the contract price upon receipt of bill of lading showing shipment from the factory; 25 per cent. of the contract price when the same shall be placed upon the foundations ready for installation; 25 per cent. of the contract price when ready for operation; the remainder of the contract price upon acceptance after the final testing of the plant.

ON PART IV, in full within 30 days after the arrival of the gates at destination in good order.

ON PART V, payments will be made monthly between the 10th and 15th of each month to the extent of 75 per cent. of the value of the work completed during the preceding calendar month, as shown by the estimates of the Engineer; the remainder of the contract price upon the final acceptance of the work.

6. The Commissioners reserve the right to reject any or all bids.

A. O. AUTEN,
S. M. REDDISH,
GEO. W. EDWARDS,
Commissioners, Jerseyville, Illinois.
CHAS. S. WHITE, Attorney,
Jerseyville, Illinois.
HARMAN ENGINEERING CO.,
Engineers,
120 Fredonia Ave., Peoria, Ill.

July 20, 1908.

Plans and specifications for this work are on file at the office of Engineering News, New York.

COMMONWEALTH OF MASSACHUSETTS.—Board of Harbor and Land Commissioners, State House, Boston, July 20, 1908.—Sealed bids or proposals for dredging an anchorage basin between the wharf of the Winthrop Yacht Club and the United States Government Wharf at Winthrop, Mass., will be received by the Board of Harbor and Land Commissioners at Room 131, State House, Boston, Mass., until 2 o'clock p. m., July 31, 1908, and then and there will be publicly opened and read. The work to be done is the dredging of about 20,000 cubic yards scow measurement of material on the easterly side of the channel to form an anchorage basin six feet deep at mean low water. All proposals must be made upon blank forms which, together with information in regard to the work, may be obtained at the office of the board, where plans and specifications may be seen. Each bidder will be required to give to the board satisfactory assurance of his competency, experience and responsibility. The right is reserved to reject any and all bids, and to waive any defect or informality at the discretion of the board. GEORGE E. SMITH, SAMUEL M. MANSFIELD, HEMAN A. HARDING, Harbor and Land Commissioners; FRANK W. HODGDON, Chief Engineer.

BUILDINGS.

NEW YORK STATE SCHOOL FOR THE BLIND.

Batavia, N. Y.

Sealed proposals endorsed, "Proposals for Main Building, Changes to Electric Light Wiring, and Fixtures, and Installing New Steel Ceilings" at the New York State School for the Blind, Batavia, N. Y., will be received by F. Park Lewis, M. D., President of the Board of Trustees, New York State School for the Blind, Batavia, N. Y., up to 4 o'clock p. m., on the 3d day of August, 1908, when they will be opened and read publicly.

Proposals shall be accompanied by a certified check in the sum of $200.00, and the contractor to whom the award is made will be required to furnish surety company's bond in the sum of $2,000.00. The right is reserved to reject any and all bids.

Drawings and specifications may be consulted, and blank forms of proposal obtained at the New York State School for the Blind, Batavia, N. Y., or at the office of the State Architect, Complete sets of plans and specifications will be furnished to prospective bidders, upon reasonable notice to and in the discretion of, the State Architect, Franklin B. Ware, Albany, N. Y.

F. PARK LEWIS,
Pres. Board of Managers.

Dated Batavia, N. Y., July 17, 1908.

SEWERS.

Lake Placid, N. Y.

Sealed proposals will be received by the Ruisseaumont Sewerage Commission, at the office of F. A. Isham, Lake Placid, N. Y., until 1 p. m., Aug. 1, 1908, for the furnishing of all material, and laying complete about two and one-half miles of sewers, varying in sizes from six to ten inches, together with all manholes, lampholes, flush-tanks, etc. Depths of trenches will vary from four feet to twenty-one feet.

Specifications, instructions to bidders, and blank forms of bidding sheets may be obtained and plans and profiles may be seen at the office of W. Z. Larned, No. 156 Broadway, New York City; or at the office of F. A. Isham, Lake Placid, N. Y.; also at the office of C. E. Collins, Consulting Engineer, Drexel Building, Philadelphia, Pa.

The right is reserved to reject any or all bids.

GEORGE A. STEVENS,
EDWIN C. CLEAVES,
HARRY W. MACK,
Commissioners.

SIDEWALKS.

Lafayette, La.

Bids are requested for the construction of cement sidewalks in the City of Lafayette, La.: Width of walks, 4, 5 and 6 ft. Bids to be given on the following quantities separately: 2½ miles long; 5 mi. long; 7½ mi. long and 10 mi. long. Specifications in office of J. P. Colomb, Secy. City of Lafayette, La. All bids must be in hands of secretary by August 1st. We reserve the right to reject any or all bids.

O. B. HOPKINS,
A. R. TRAHAN,
A. E. MOUTON,
Committee.

Lafayette, La., July 15th, 1908.

DITCHES.

Angleton, Tex.

Sealed proposals will be received by the Board of Commissioners of Angleton Drainage District of Brazoria County, at office of Masterton Bros., until 12 o'clock noon, July 30, for the construction of canals, ditches and ditches. Certified check 5 per cent. Plans, etc., at office of J. L. Myers, Engr.-in-Charge.

F. OBERHELMAN,
Chairman.
F. KIBER,
Secretary.

DEPARTMENT OF THE INTERIOR, July 15, 1908.—Sealed proposals will be received at this Department until 2 o'clock p. m., July 24, 1908, and then opened for the installation of improvement in heating system of the Interior Department (Patent Office) building, Washington, D. C., in accordance with specifications and drawings, copies of which may be obtained upon application to the Chief Clerk of this Department. FRANK PIERCE, Acting Secretary.

U. S. ENGR. OFFICE, Box 67, St. Paul, Minn., July 18, 1908.—Sealed proposals for keeper's dwelling and office building at Pokegama Dam, Mississippi River, near Grand Rapids, Minn., will be received at this office until 2:00 P. M., August 17, 1908, and then publicly opened. Information furnished on application. FRANCIS R. SHUNK, Major, Engrs.

Situations Wanted

SURVEYOR, I. C. S. graduate, with experience in office and field (competent as transitman) work, wishes permanent position in any locality; reference if desired. R. A. KEMPTON, 32 So. 34th St., Camden, N. J. 4-1t

WANTED—Position by young man (24), experienced as instrumentman and draftsman on location and real estate surveys. References. Address "O. 1," Engineering News, New York. 4-3t

Situations Open

WANTED—Stationary Engineer, Fireman, Traction Engine and Steam Roller Engineers. Must have Massachusetts license. FICKLEN-BAKER CONSTRUCTION CO., Feeding Hills, Mass. 4-1t

Miscellaneous Wants

WANTED.

Pipe, 1,500 ft., 10" or 20", wrought, cast or spiral, for dredging; also 150 ft. 18" cast iron.
Engine, one marine compound, 50 to 100 HP.
Belt, 36" to 40" wide, by 60' to 70' long, leather or rubber. 4-1t

W. H. FLAHERTY,
116 Winthrop St. Brooklyn, N. Y.

FOR SALE

Complete Contractor's Plant

FOR SALE.

Including Air Compressor and Receiver; Cableways; Boom Derricks; Ingersoll Steam or Air Drills; Columns, Blacksmith Shop, Tools; Pipe, etc.
Can be seen in operation. For sale cheap. Write or call. 4-1t

CAPONE & TROST,
447 Summit Ave., West Hoboken, N. J.

FOR SALE

3—Cableways, 365-ft. span, 8 × 12 Engines with boilers, 30-ft. towers. All cables, blocks and fittings complete. Good as new.
5—40-HP. Loco. Boilers, Water Front, on steel wheels. Very fine.
1—No. 2 Ransome Mixer, with Engine and Boiler on wheels. New fittings. Must be sold. $350.00 cash.
2—Electric Locomotives.
1—Air Compressor, Ingersoll-Sergeant, 20 × 20¼ × 24, Class A. Complete.
1—Complete Steam Shovel Outfit for sale or rent: 45-ton Marion, 2 Vulcan Locomotives, 16 4-yd. Cars and Rail.
Steam Shovels, Locomotives, Cars, Hoists, Boilers, Pumps, Crushers, etc. Send for List.
2—150-HP. Horizontal Boilers, complete with all fittings. Must be moved immediately. Sacrifice at $300 each.

The New York Purchasing Agency
Incorporated,
76 Pine Street,
New York City, N. Y. 4-1t